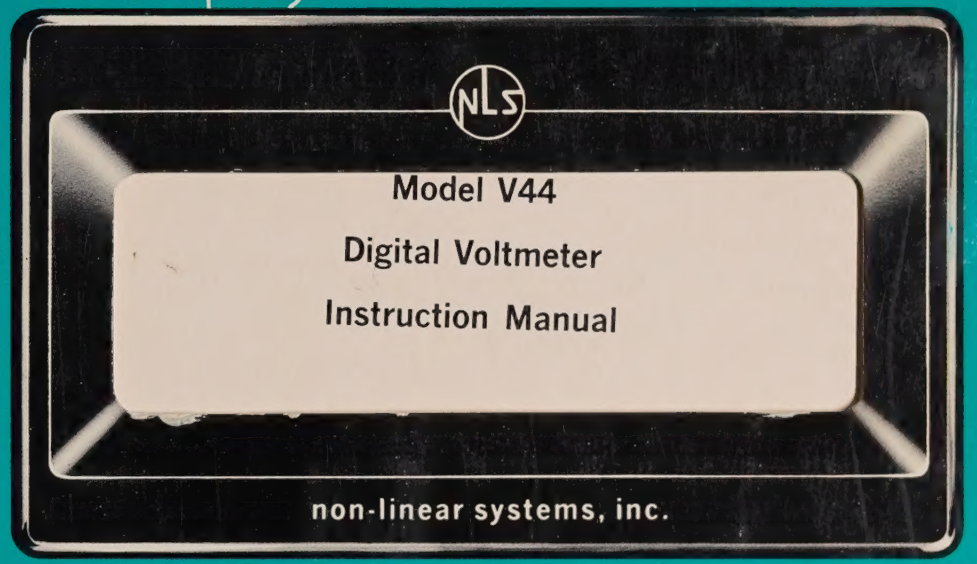
Model V44
Digital Voltmeter
Instruction Manual
non-linear systems, inc.

BACK

Model V44
Digital Voltmeter
Instruction Manual

The V44 Digital Voltmeter
Part I is located in the fro
Part I contains text; Part I
and parts lists.

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NOTE:

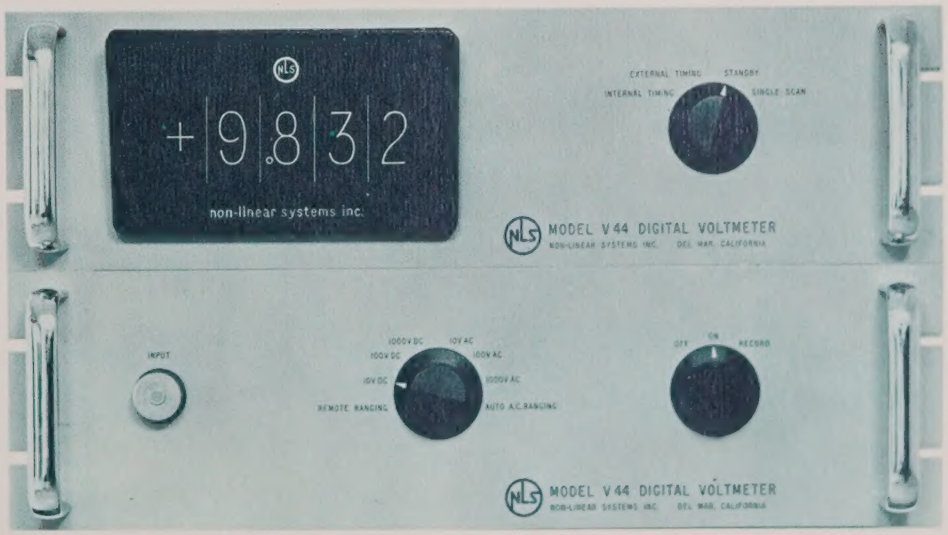
The V44 Digital Voltmeter Instruction Manual is in two parts. Part I, supplied in the front cover envelope of Part II, contains text discussion relating to the figures, tables, schematics and parts list data of Part II.

Model V44

Digital Voltmeter

Instruction Manual

Part II



Non-Linear Systems, Inc.
Del Mar, California

This manual is for instrument Serial No._____

V44; 1st printing; 300; Nov., 1961

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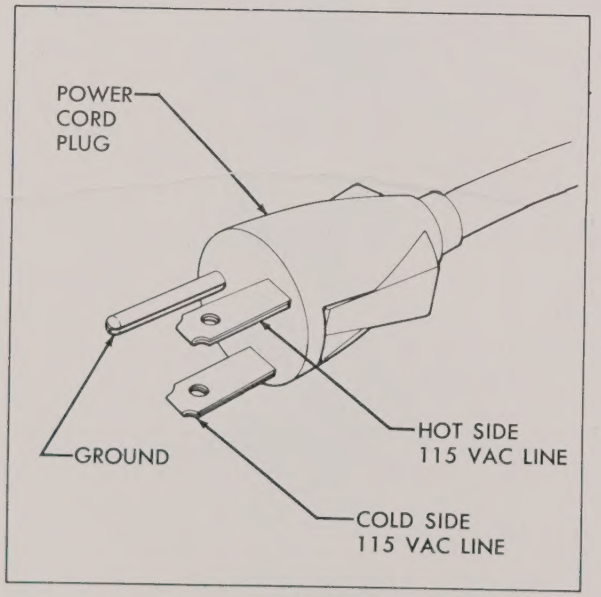


Figure 2-1 Power Plug Pin Coding

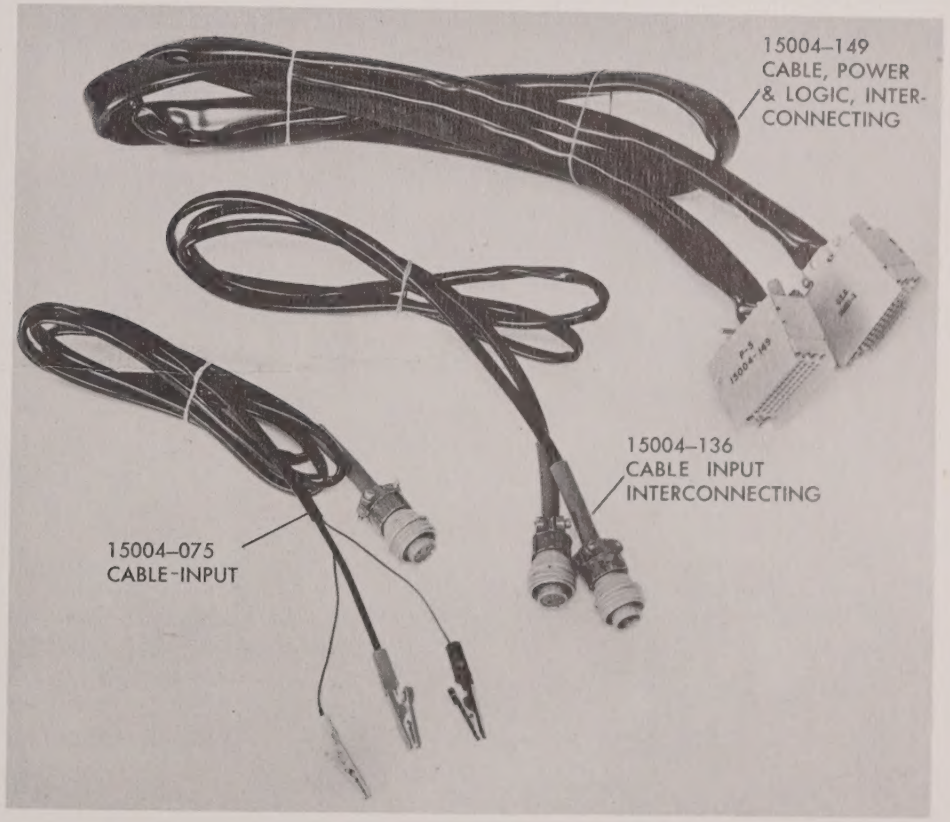
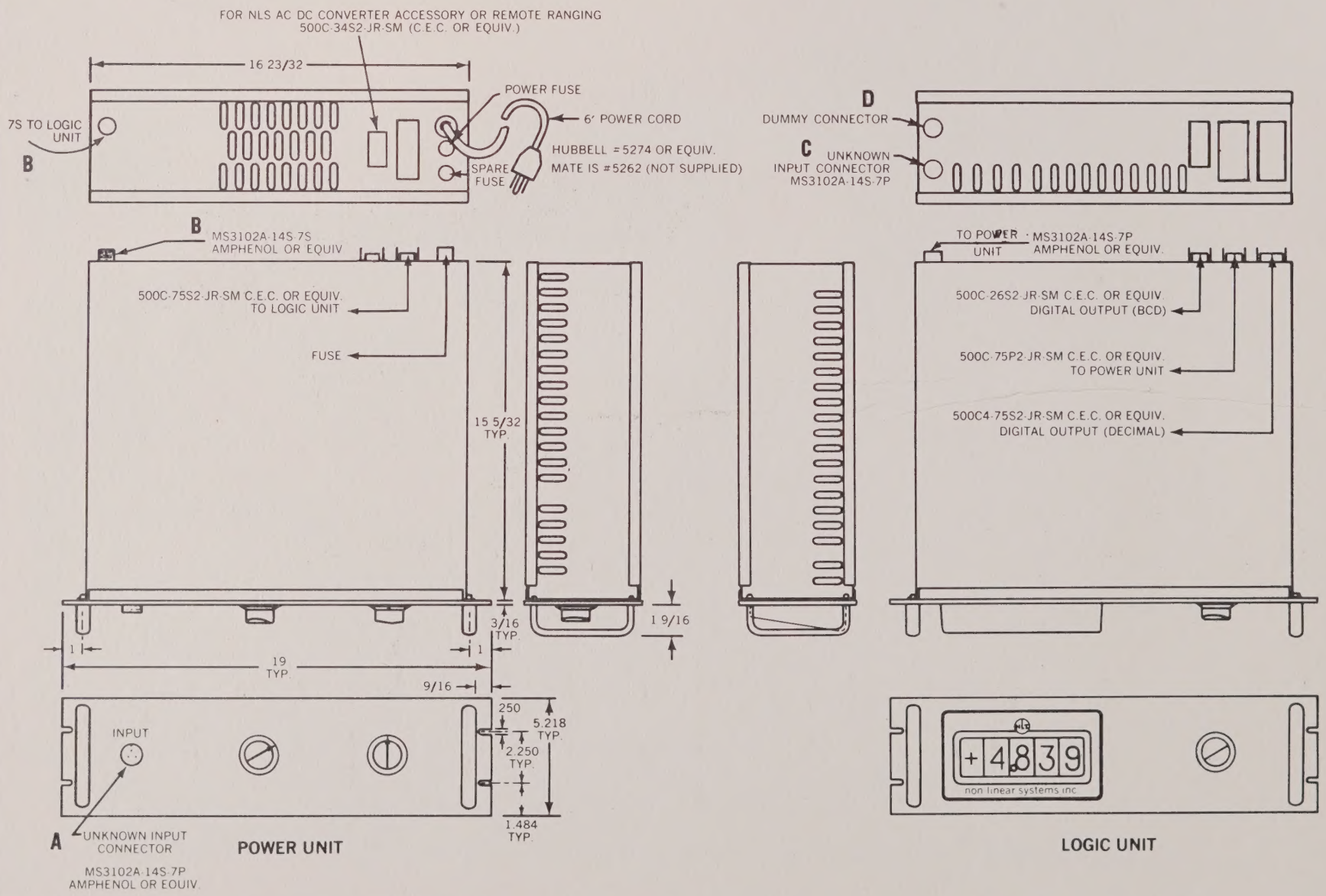
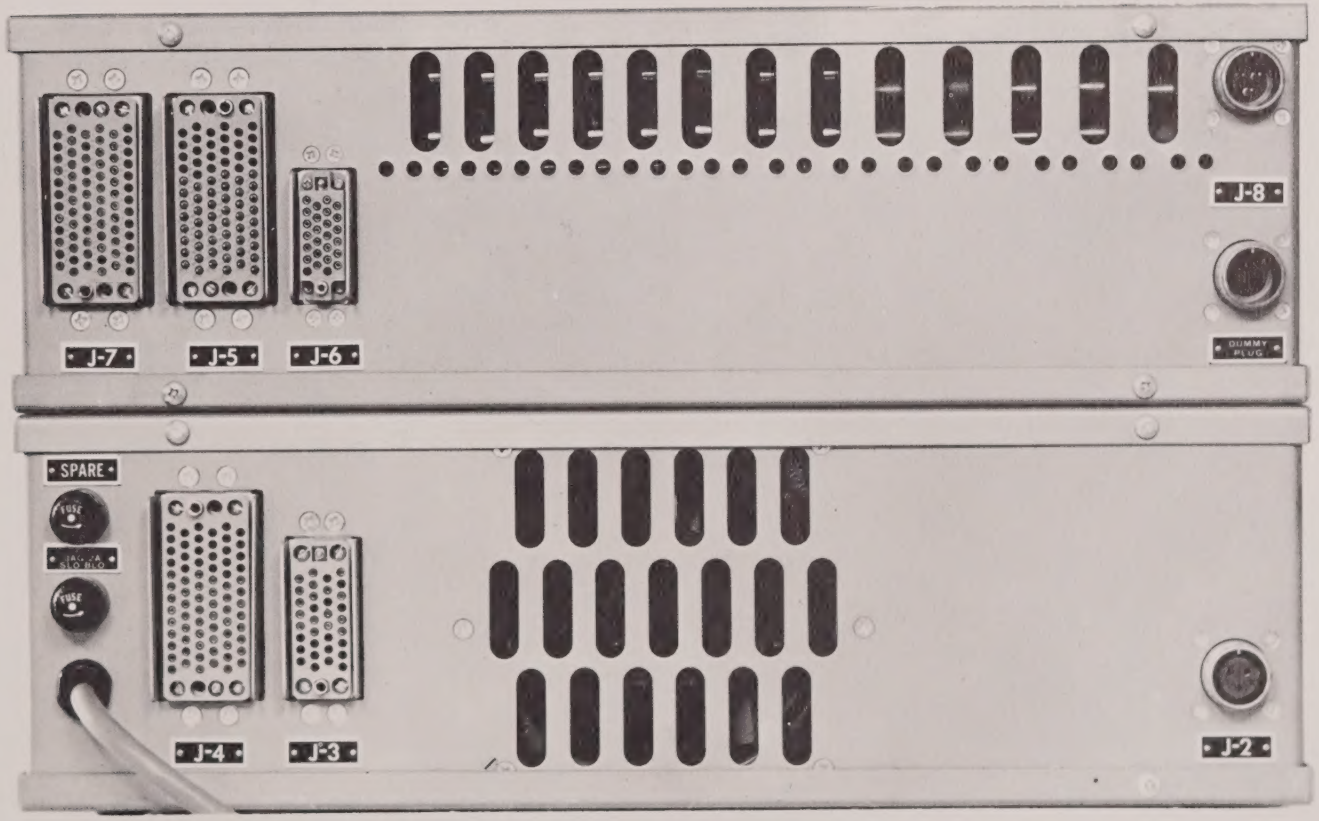


Figure 2-2 Cables Used with V44 Digital Voltmeter.

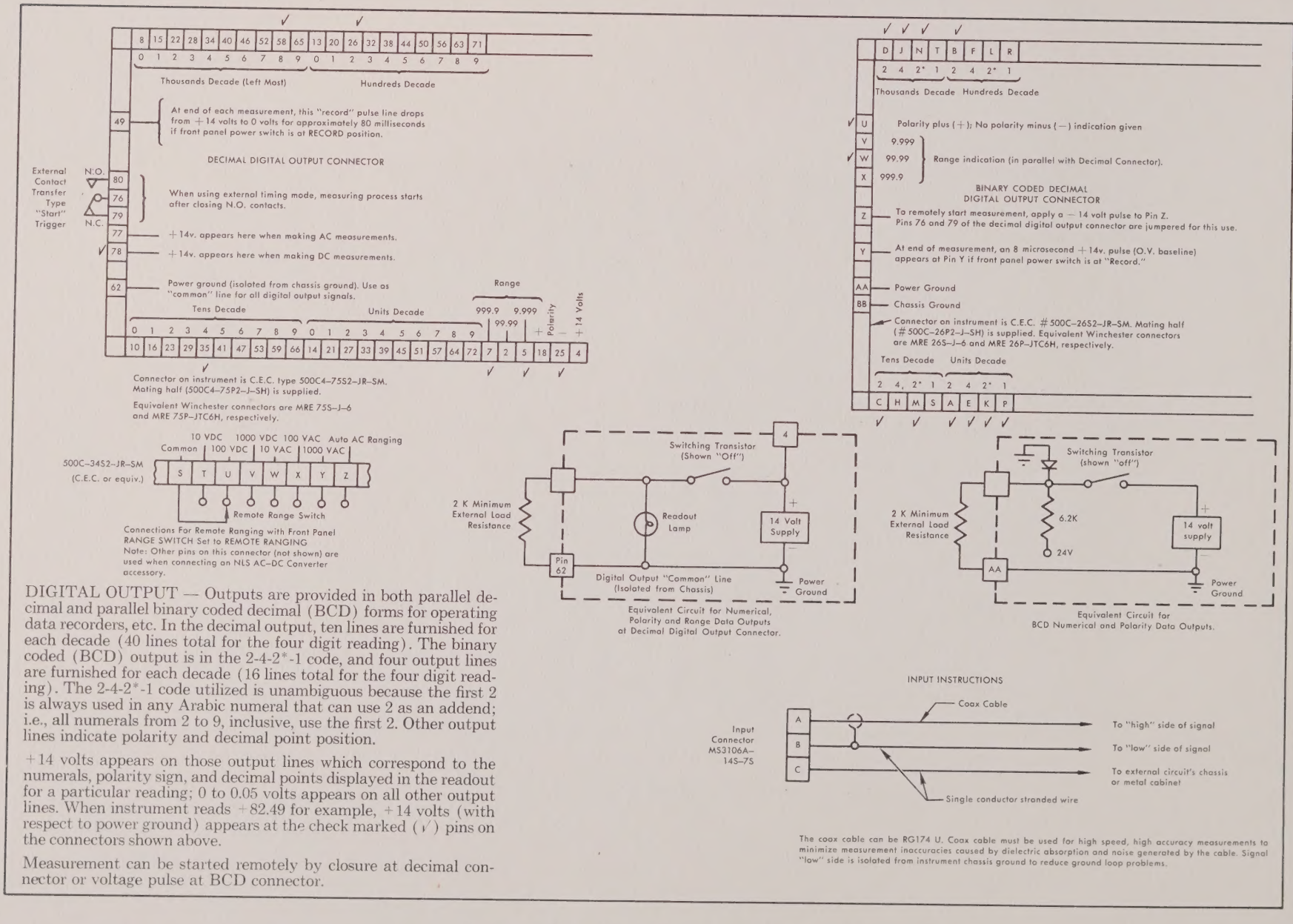


NOTE: The shockproof input system works as follows:
FRONT PANEL INPUT - Input signals plugged into connector A go to B , then through a cable to connector C , and thereby into the measuring circuits in the logic unit.
REAR PANEL INPUT - Disconnect power-unit cable from connector C and plug it into D (which is an unconnected dummy connector). Then plug input signal cable into connector C . Note that only female connectors are "hot".

Figure 2-3 Shockproof Input System



2-4 Rear View, Showing Cable Connectors


8 15 22 28 34 40 46 52 58 65 13 20 26 32 38 44 50 56 63 71
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9
Thousands Decade (Left Most)
Hundreds Decade
At end of each measurement, this "record" pulse line drops from +14 volts to 0 volts for approximately 80 milliseconds if front panel power switch is at RECORD position.
DECIMAL DIGITAL OUTPUT CONNECTOR
External Contact Transfer Type "Start" Trigger
N.O.
N.C.
When using external timing mode, measuring process starts after closing N.O. contacts.
+14v. appears here when making AC measurements.
+14v. appears here when making DC measurements.
Power ground (isolated from chassis ground). Use as "common" line for all digital output signals.
Range
Tens Decade
Units Decade
999.9
9.999
99.99
Polarity
+ 14 Volts
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9
10 16 23 29 35 41 47 53 59 66 14 21 27 33 39 45 51 57 64 72 7 2 5 18 25 4
Connector on instrument is C.E.C. type 500C4–75S2–JR–SM. Mating half (500C4–75P2–J–SH) is supplied.
Equivalent Winchester connectors are MRE 75S–J–6 and MRE 75P–JTC6H, respectively.
10 VDC
1000 VDC
100 VAC
Auto AC Ranging
Common
100 VDC
10 VAC
1000 VAC
500C–34S2–JR–SM
(C.E.C. or equiv.)
S T U V W X Y Z
Remote Range Switch
Connections For Remote Ranging with Front Panel RANGE SWITCH Set to REMOTE RANGING
Note: Other pins on this connector (not shown) are used when connecting an NLS AC–DC Converter accessory.
D J N T B F L R
2 4 2* 1 2 4 2* 1
Thousands Decade
Hundreds Decade
U
V
W
X
9.999
99.99
999.9
Polarity plus (+); No polarity minus (−) indication given
Range indication (in parallel with Decimal Connector).
BINARY CODED DECIMAL DIGITAL OUTPUT CONNECTOR
Z
To remotely start measurement, apply a − 14 volt pulse to Pin Z. Pins 76 and 79 of the decimal digital output connector are jumpered for this use.
Y
At end of measurement, an 8 microsecond +14v. pulse (O.V. baseline) appears at Pin Y if front panel power switch is at "Record."
AA
Power Ground
BB
Chassis Ground
Connector on instrument is C.E.C. #500C–26S2–JR–SM. Mating half (#500C–26P2–J–SH) is supplied. Equivalent Winchester connectors are MRE 26S–J–6 and MRE 26P–JTC6H, respectively.
Tens Decade
Units Decade
2 4 2* 1 2 4 2* 1
C H M S A E K P
Switching Transistor (Shown "Off")
4
2 K Minimum External Load Resistance
Readout Lamp
14 Volt Supply
Pin 62
Digital Output "Common" Line (Isolated from Chassis)
Power Ground
Equivalent Circuit for Numerical, Polarity and Range Data Outputs at Decimal Digital Output Connector.
Switching Transistor (shown "off")
2 K Minimum External Load Resistance
6.2K
24V
14 volt supply
AA
Power Ground
Equivalent Circuit for BCD Numerical and Polarity Data Outputs.
INPUT INSTRUCTIONS
Input Connector MS3106A–14S–7S
A
B
C
Coax Cable
To "high" side of signal
To "low" side of signal
To external circuit's chassis or metal cabinet
Single conductor stranded wire
The coax cable can be RG174 U. Coax cable must be used for high speed, high accuracy measurements to minimize measurement inaccuracies caused by dielectric absorption and noise generated by the cable. Signal "low" side is isolated from instrument chassis ground to reduce ground loop problems.

DIGITAL OUTPUT — Outputs are provided in both parallel decimal and parallel binary coded decimal (BCD) forms for operating data recorders, etc. In the decimal output, ten lines are furnished for each decade (40 lines total for the four digit reading). The binary coded (BCD) output is in the 2-4-2*-1 code, and four output lines are furnished for each decade (16 lines total for the four digit reading). The 2-4-2*-1 code utilized is unambiguous because the first 2 is always used in any Arabic numeral that can use 2 as an addend; i.e., all numerals from 2 to 9, inclusive, use the first 2. Other output lines indicate polarity and decimal point position.

+14 volts appears on those output lines which correspond to the numerals, polarity sign, and decimal points displayed in the readout for a particular reading; 0 to 0.05 volts appears on all other output lines. When instrument reads +82.49 for example, +14 volts (with respect to power ground) appears at the check marked (✓) pins on the connectors shown above.

Measurement can be started remotely by closure at decimal connector or voltage pulse at BCD connector.

Figure 2–5. Digital Output and Remote Control Data

2-6 Front Panel Controls

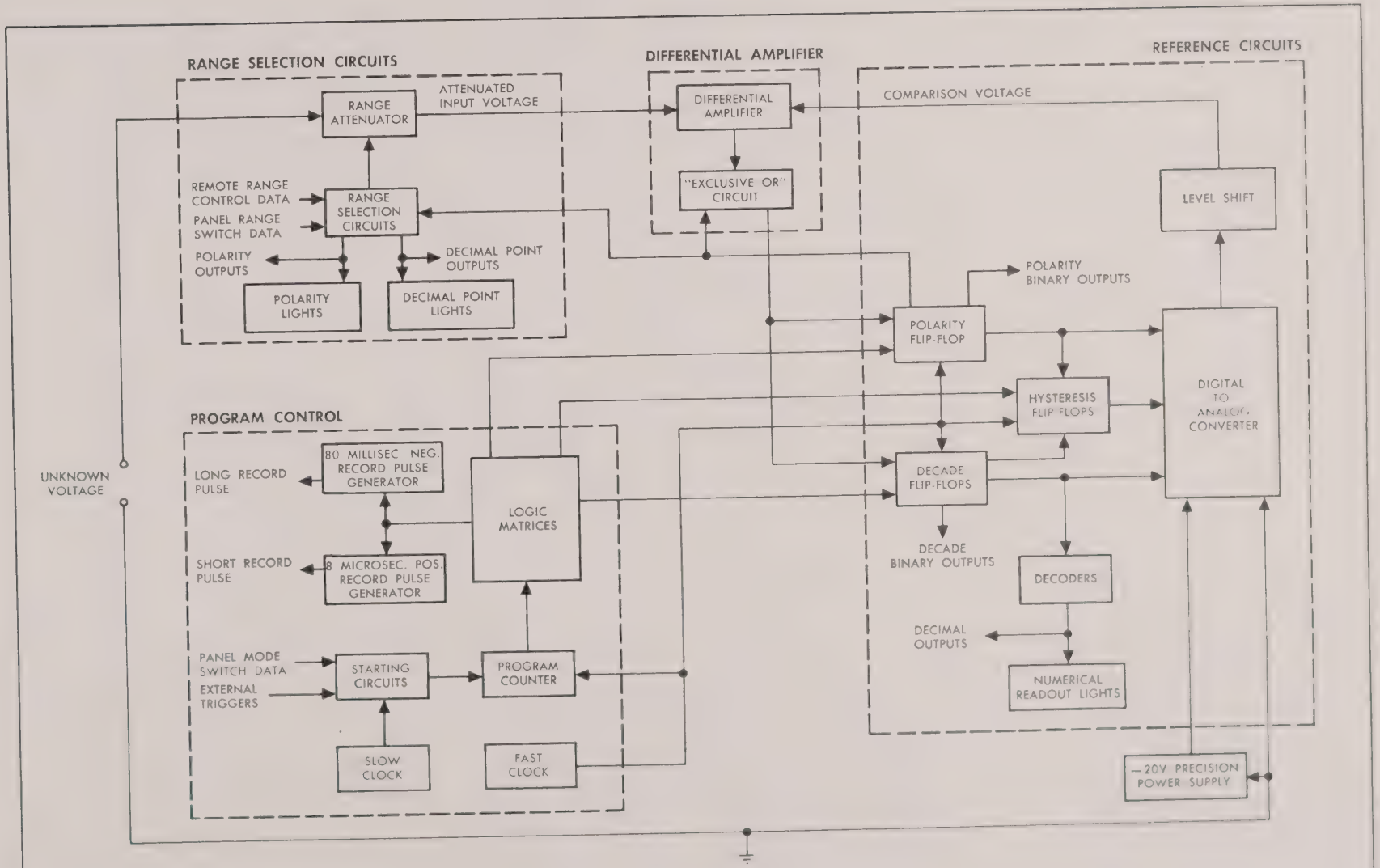


Figure 4–1. V44 Digital Voltmeter. Block Diagram

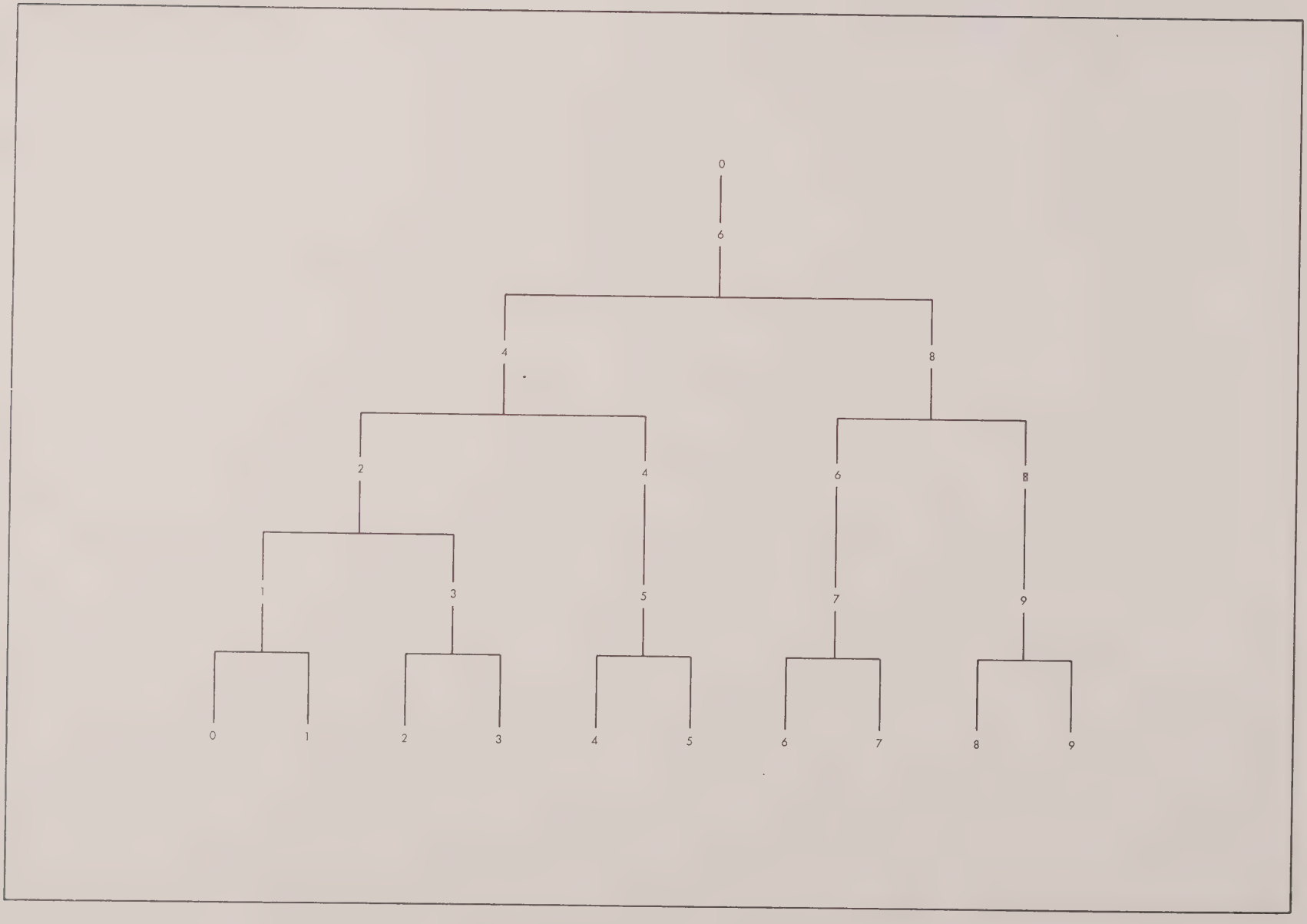


Figure 4–2. Decade Comparison Voltage Sequence.

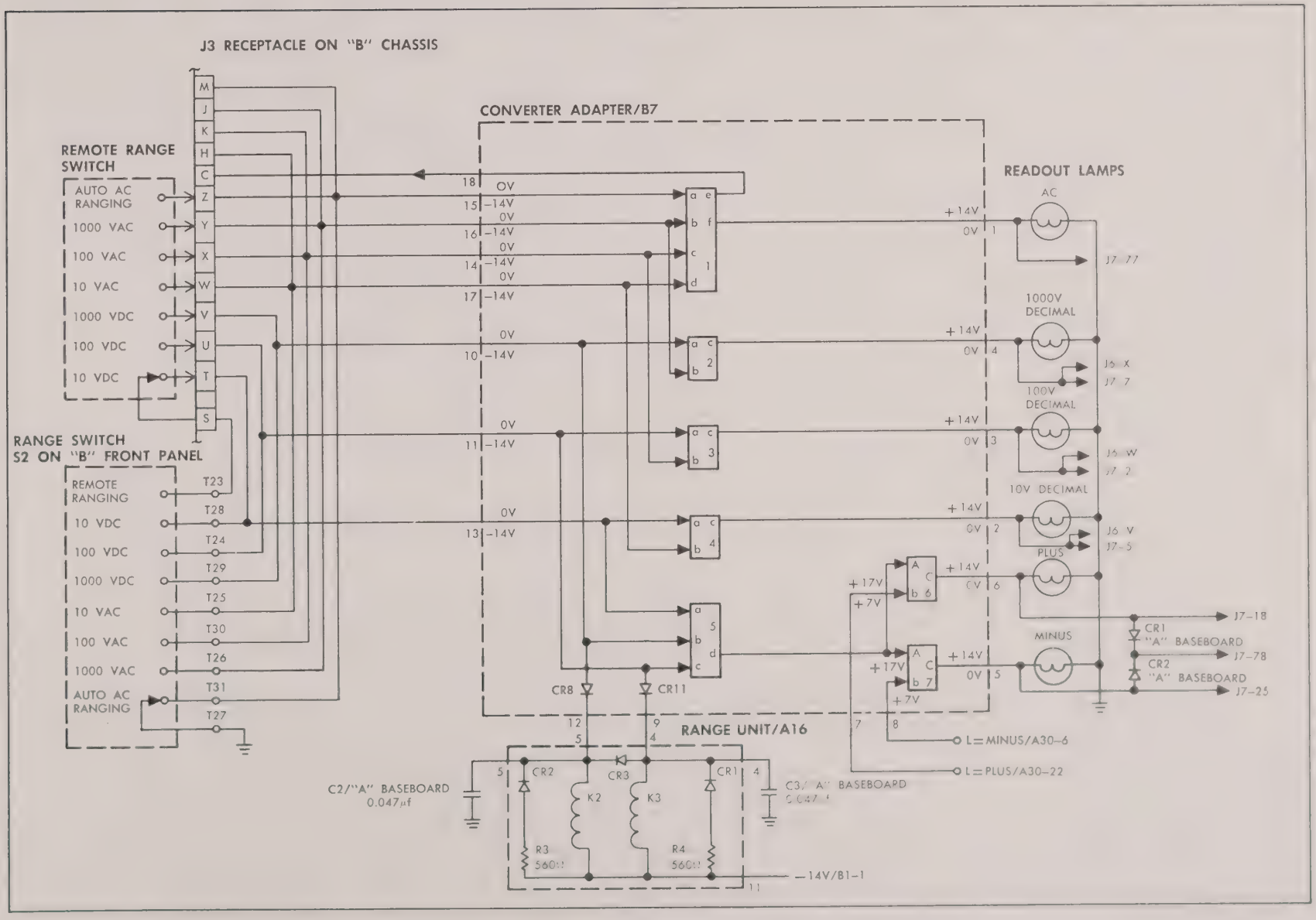
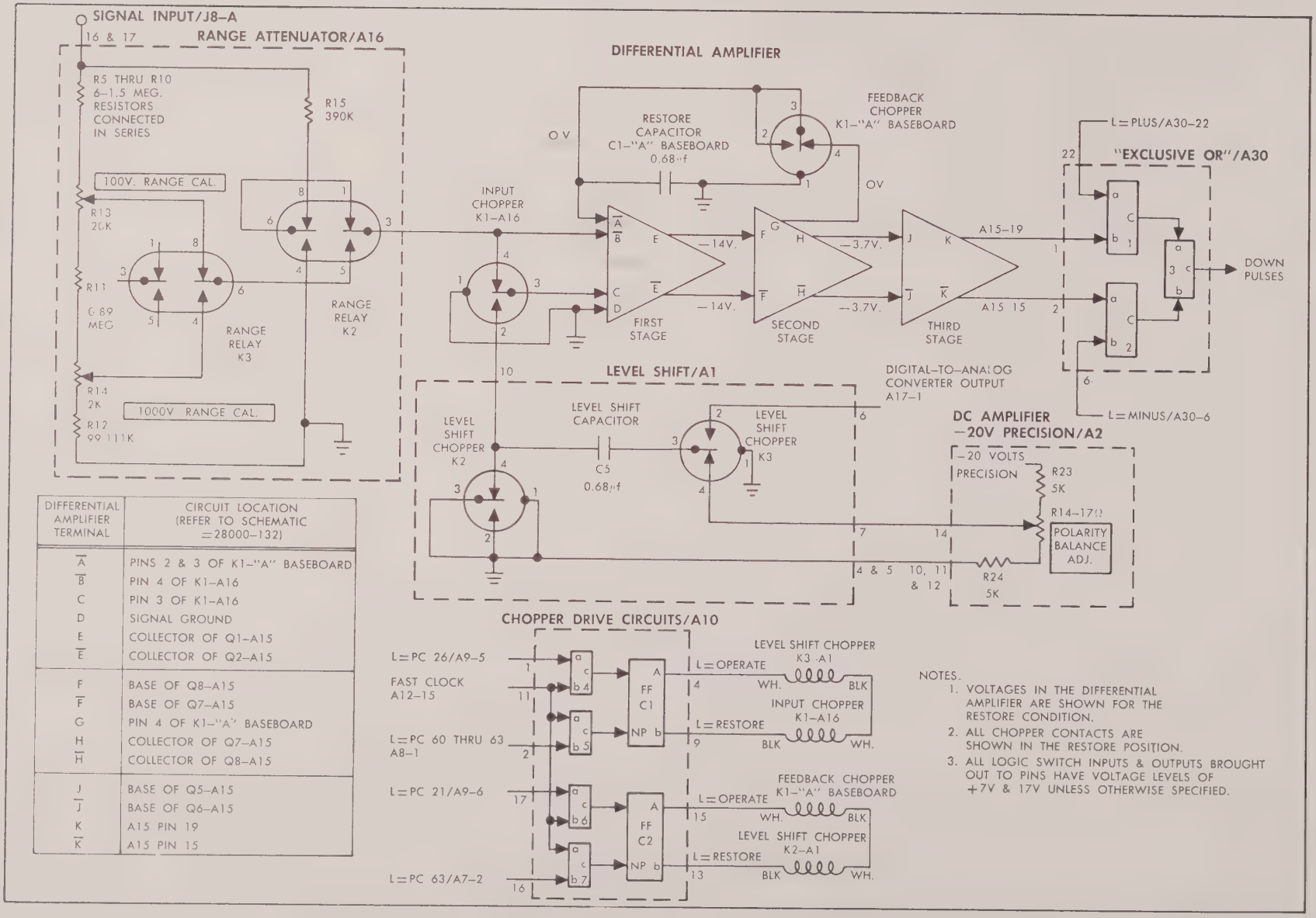


Figure 4–3. Block Diagram: Range Selection Circuits.



DIFFERENTIAL AMPLIFIER TERMINAL	CIRCUIT LOCATION (REFER TO SCHEMATIC =28000–132)
$\overline{A}$	PINS 2 & 3 OF K1–"A" BASEBOARD
$\overline{B}$	PIN 4 OF K1–A16
C	PIN 3 OF K1–A16
D	SIGNAL GROUND
E	COLLECTOR OF Q1–A15
$\overline{E}$	COLLECTOR OF Q2–A15
F	BASE OF Q8–A15
$\overline{F}$	BASE OF Q7–A15
G	PIN 4 OF K1–"A" BASEBOARD
H	COLLECTOR OF Q7–A15
$\overline{H}$	COLLECTOR OF Q8–A15
J	BASE OF Q5–A15
$\overline{J}$	BASE OF Q6–A15
K	A15 PIN 19
$\overline{K}$	A15 PIN 15

NOTES.
1. VOLTAGES IN THE DIFFERENTIAL AMPLIFIER ARE SHOWN FOR THE RESTORE CONDITION.
2. ALL CHOPPER CONTACTS ARE SHOWN IN THE RESTORE POSITION.
3. ALL LOGIC SWITCH INPUTS & OUTPUTS BROUGHT OUT TO PINS HAVE VOLTAGE LEVELS OF +7V & 17V UNLESS OTHERWISE SPECIFIED.

Figure 4–4. Block Diagram: Range Attenuator, Differential Amplifier, "Exclusive Or", Level Shift, and Chopper Drive Circuits.

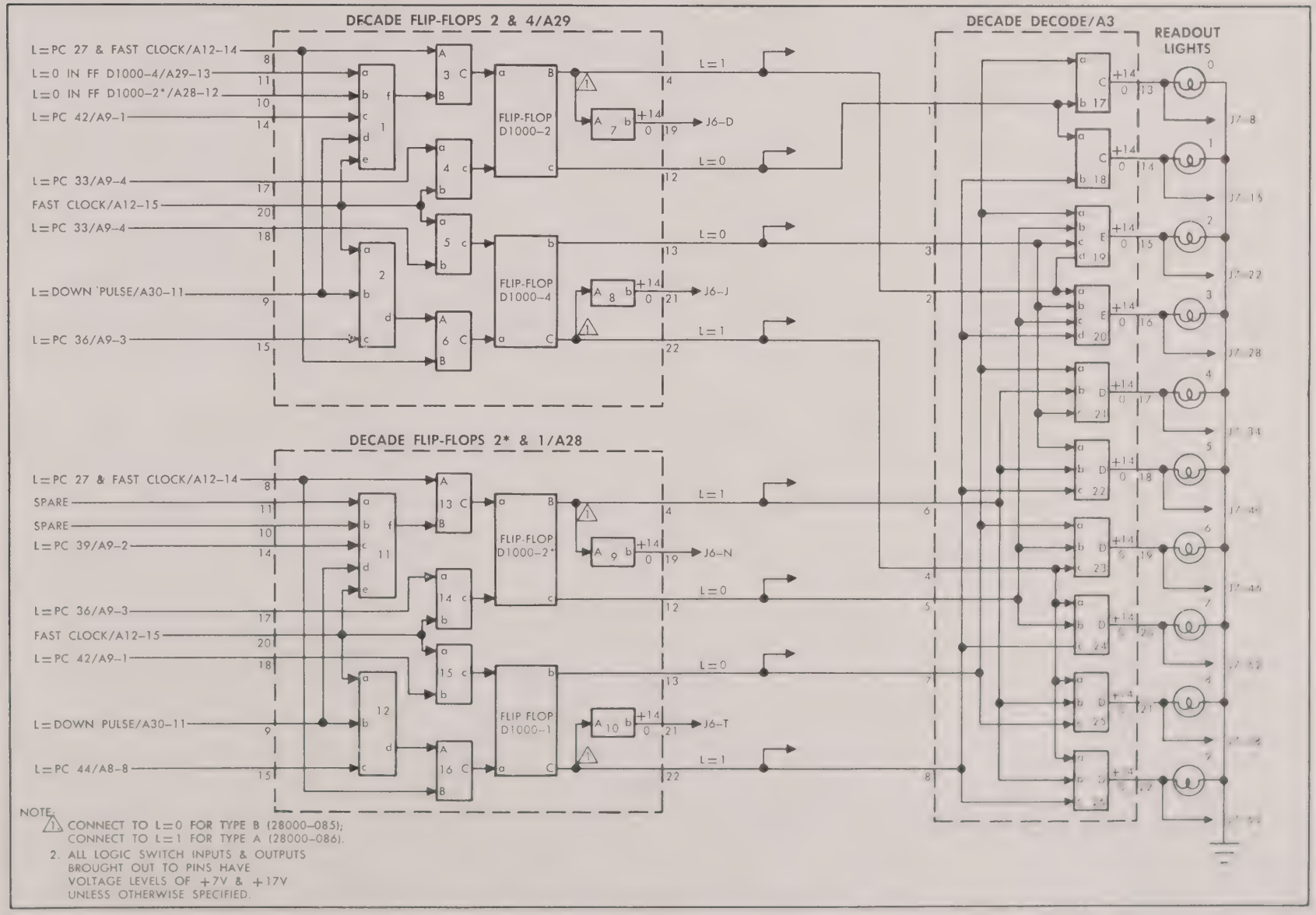


Figure 4–5. Block Diagram: Decade 1000 Flip-flops and Decode

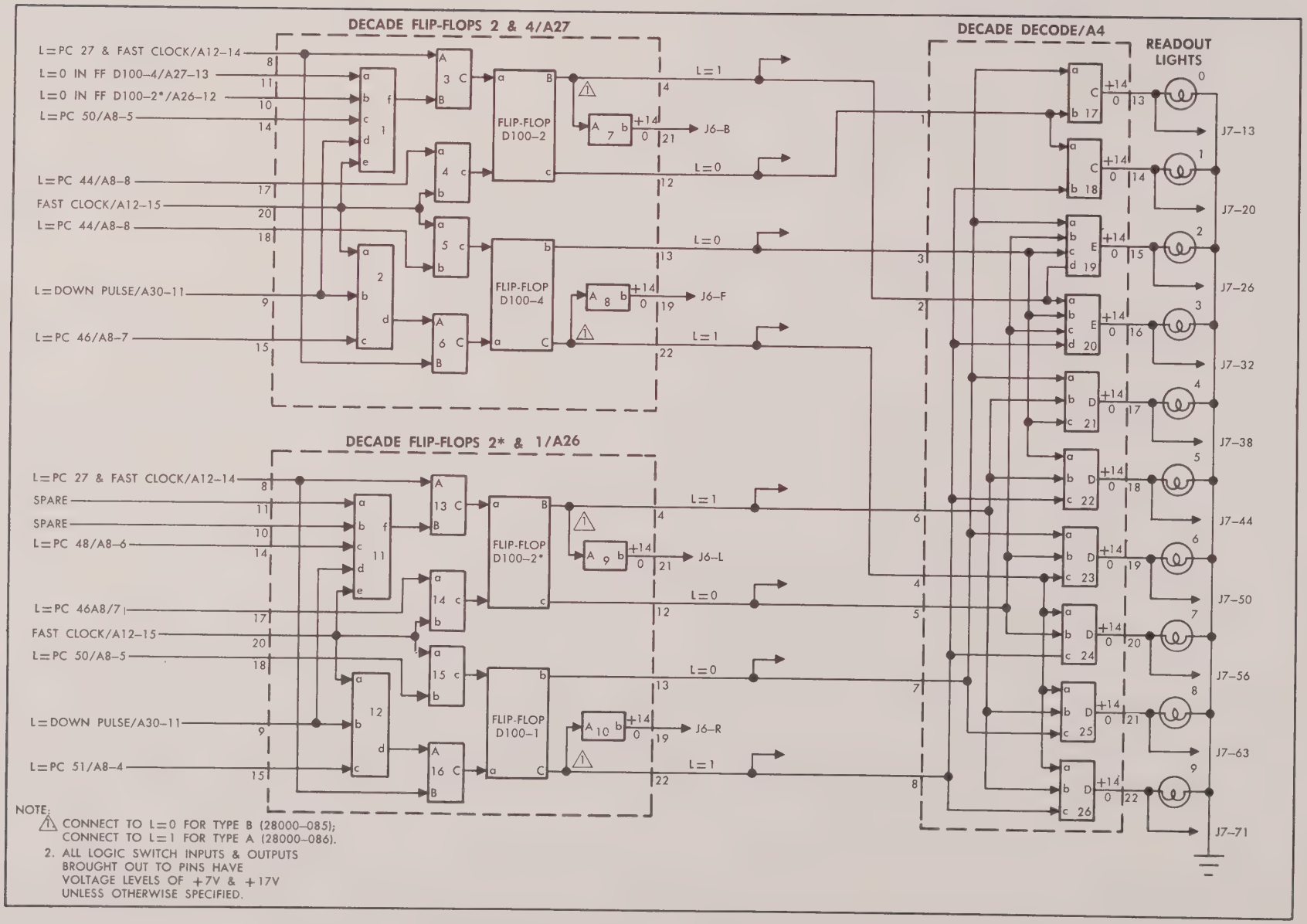


Figure 4–6. Block Diagram: Decade 100 Flip-flops and Decode.

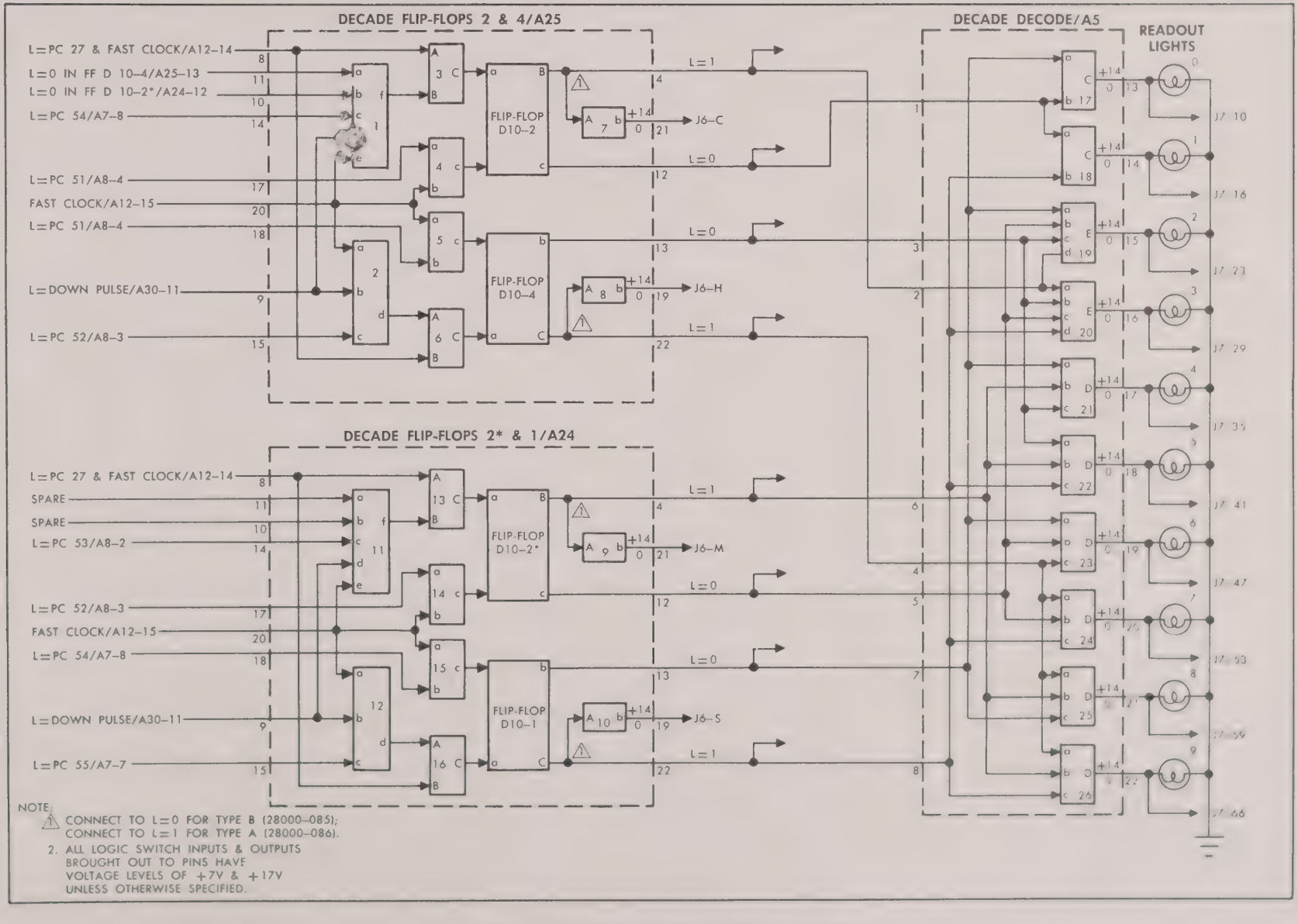


Figure 4–7. Block Diagram: Decade 10 Flip-flops and Decode.

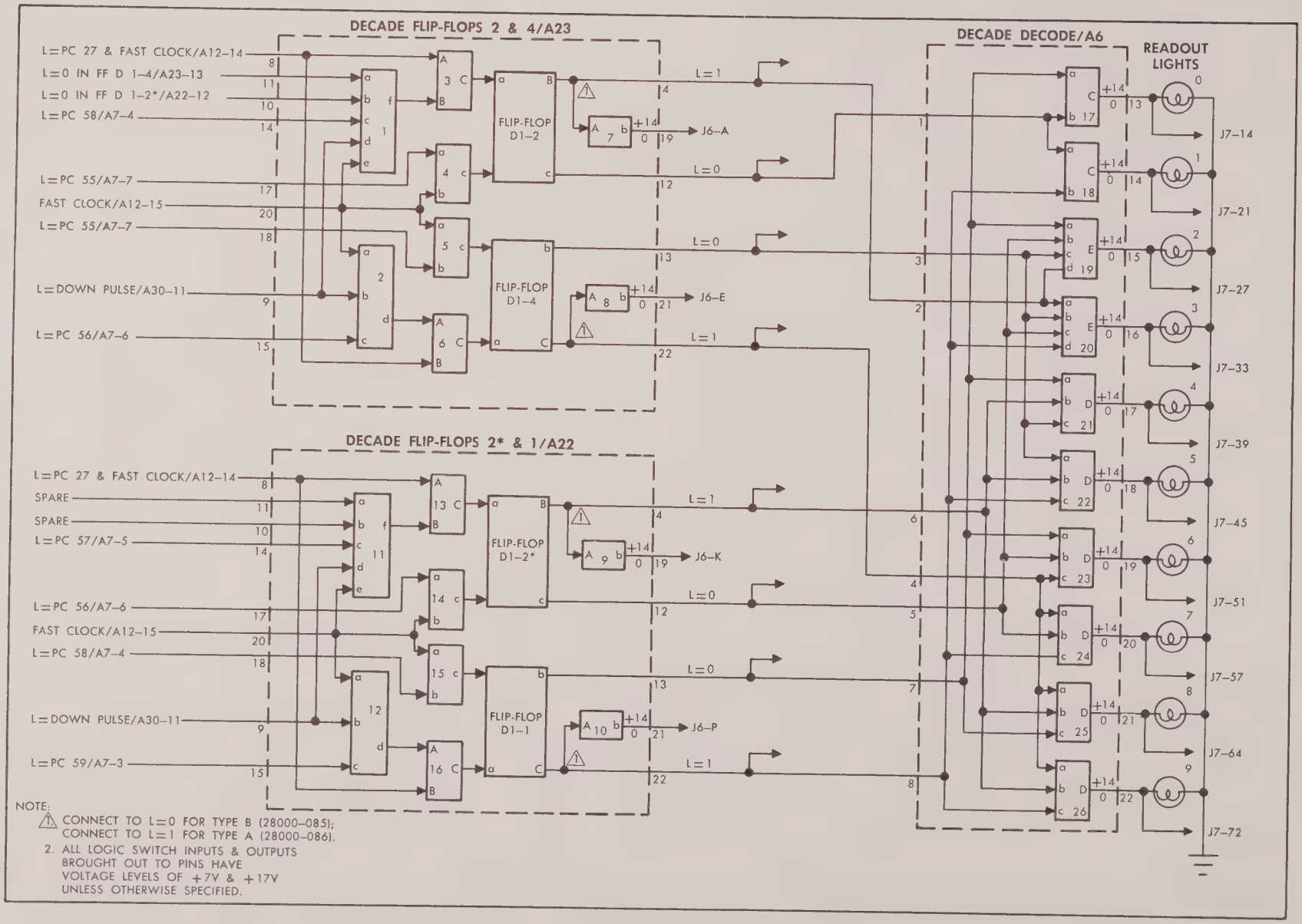


Figure 4–8. Block Diagram: Decade 1 Flip-flops and Decode.

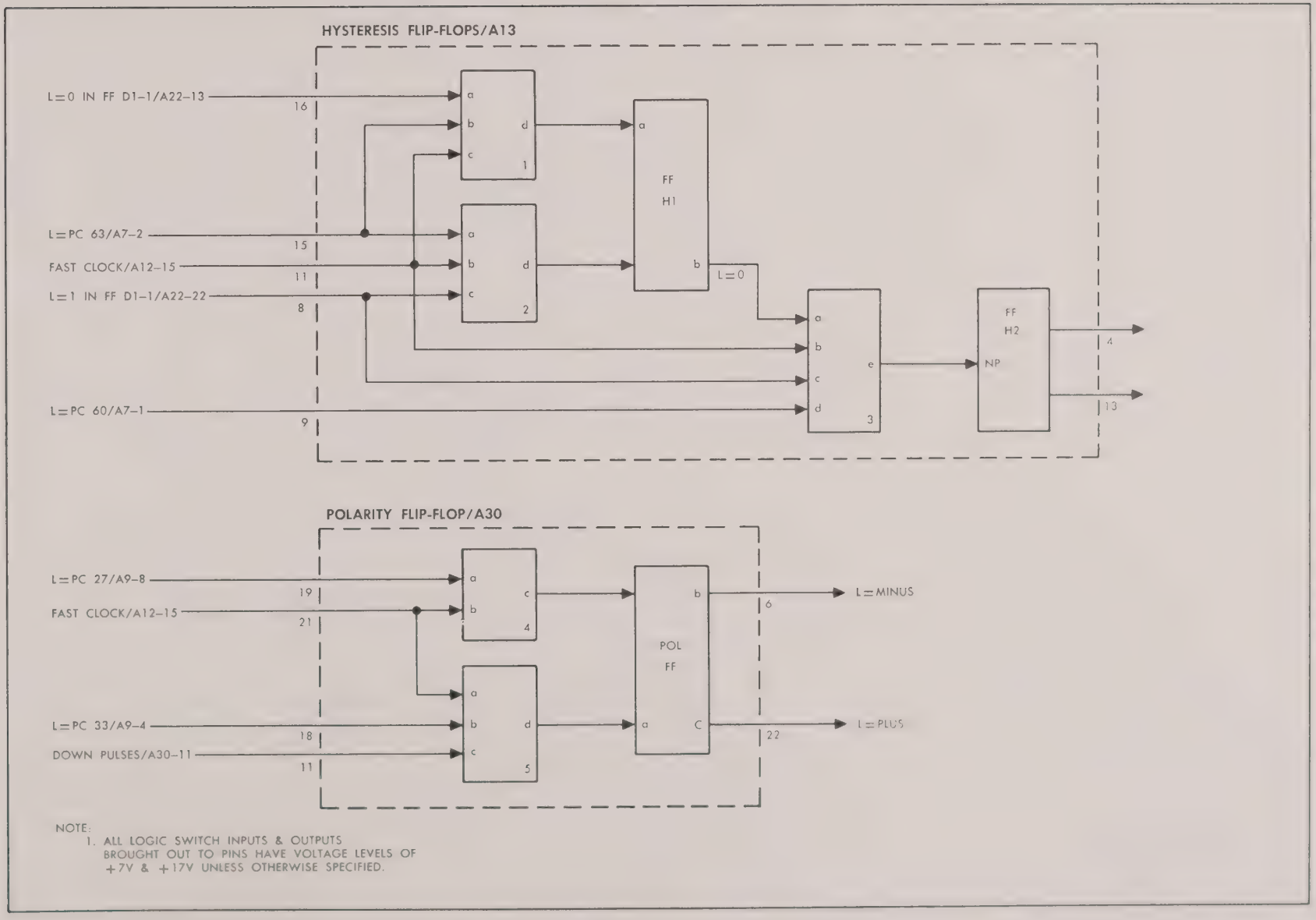


Figure 4–9. Block Diagram: Hysteresis and Polarity Flip-flops

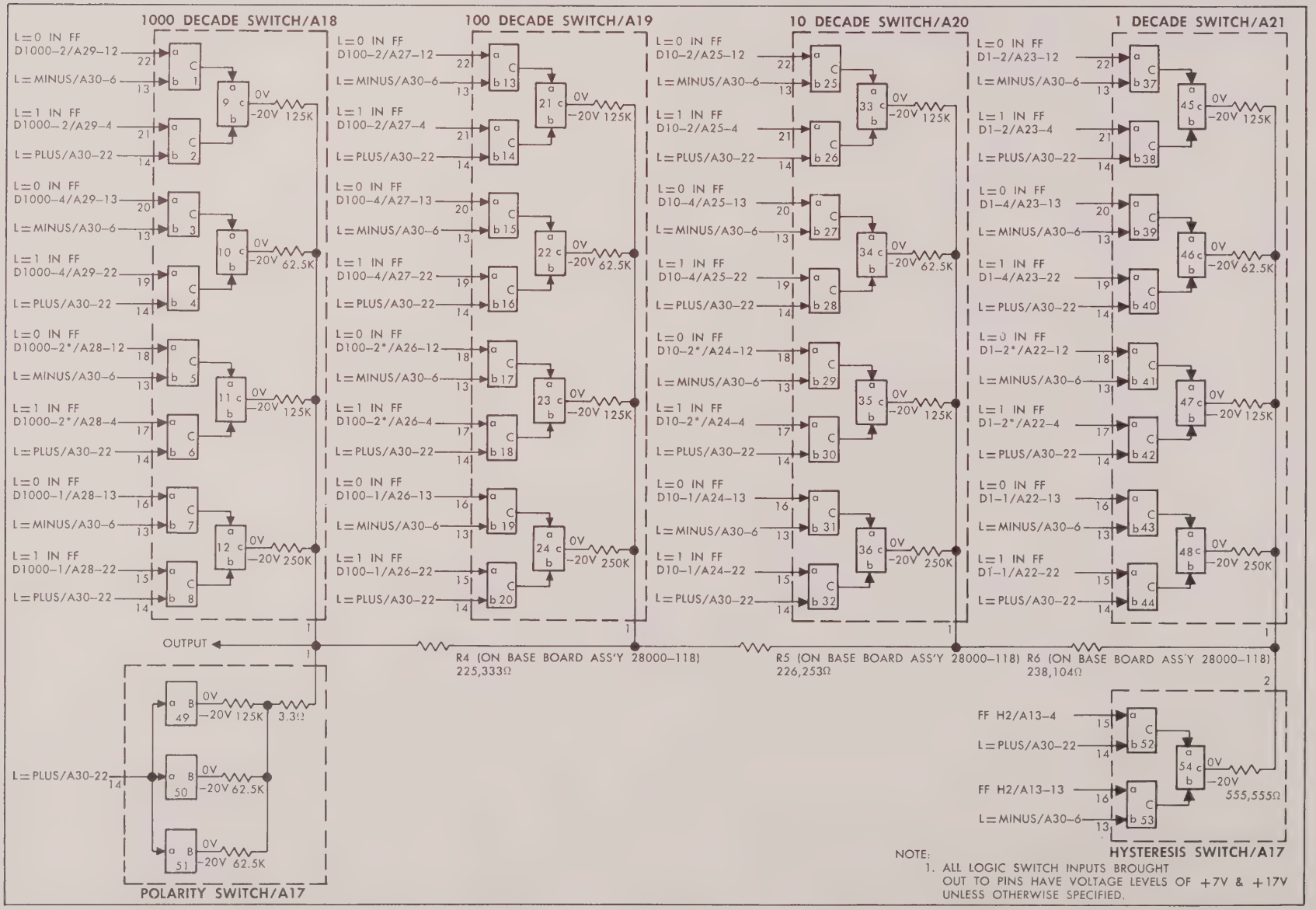


Figure 4–10. Block Diagram: Digital-to-analog Converter.

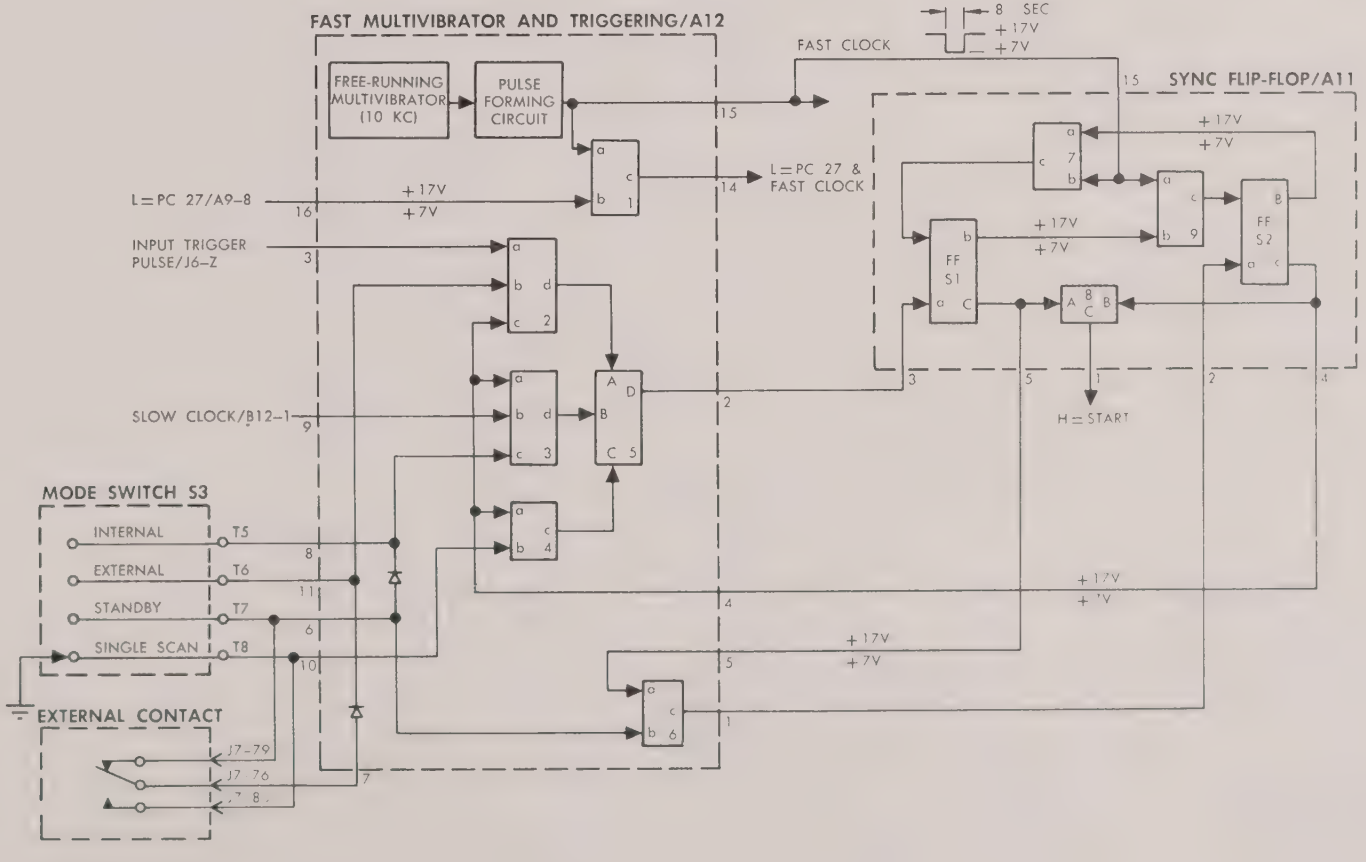


Figure 4–11. Block Diagram: Starting Circuits

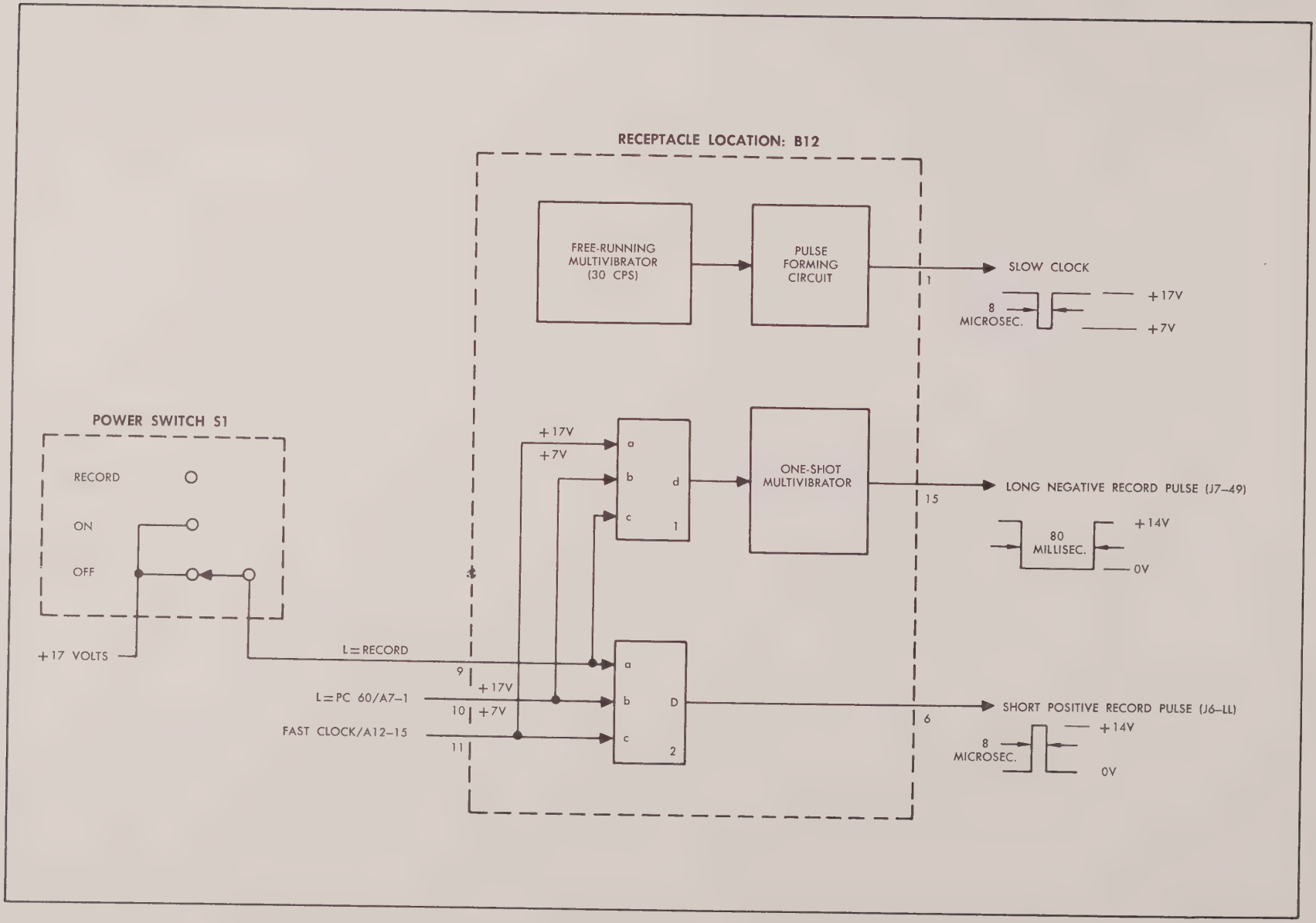


Figure 4–12. Block Diagram: One Shot, Record Pulses, and Slow Clock.

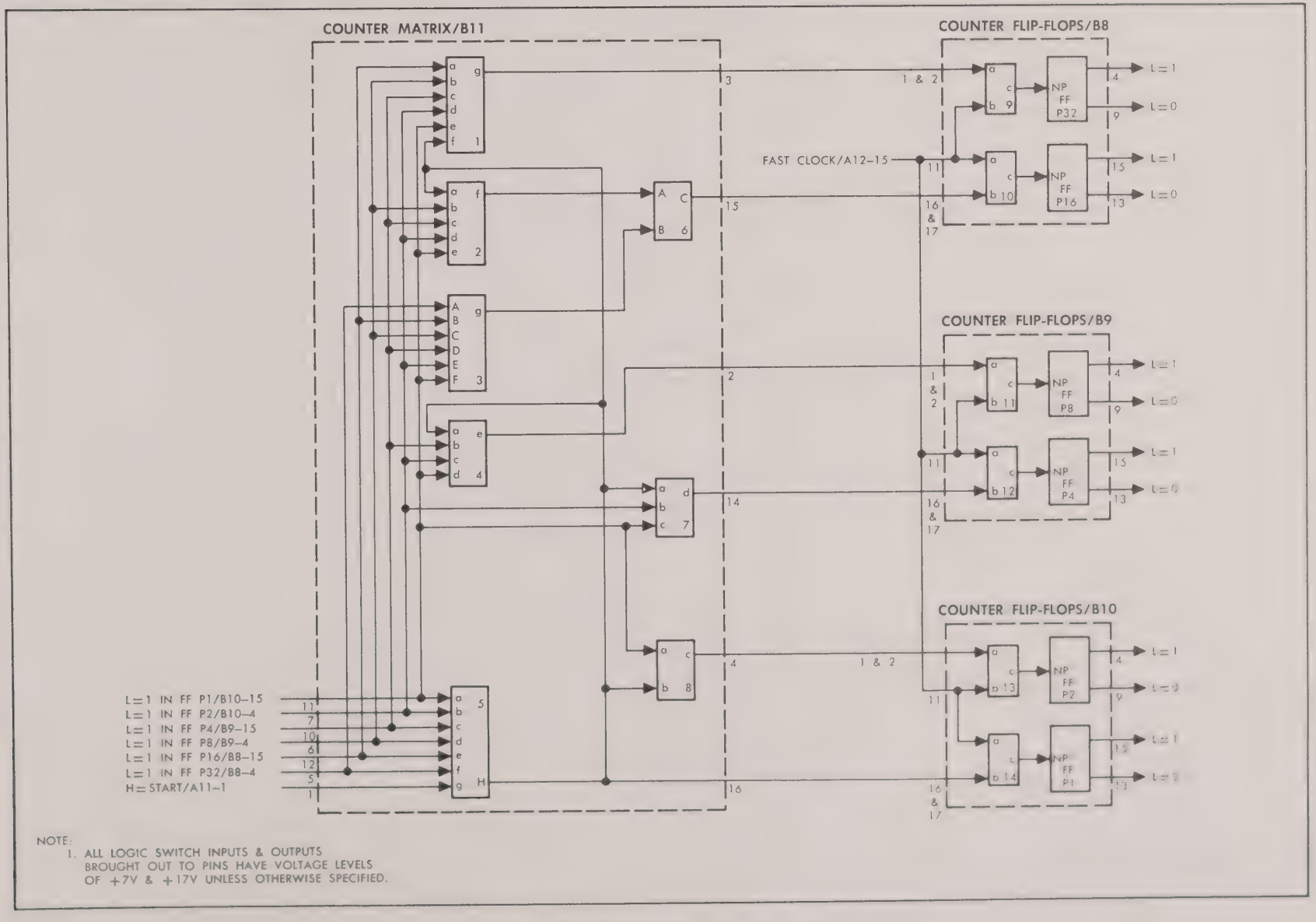
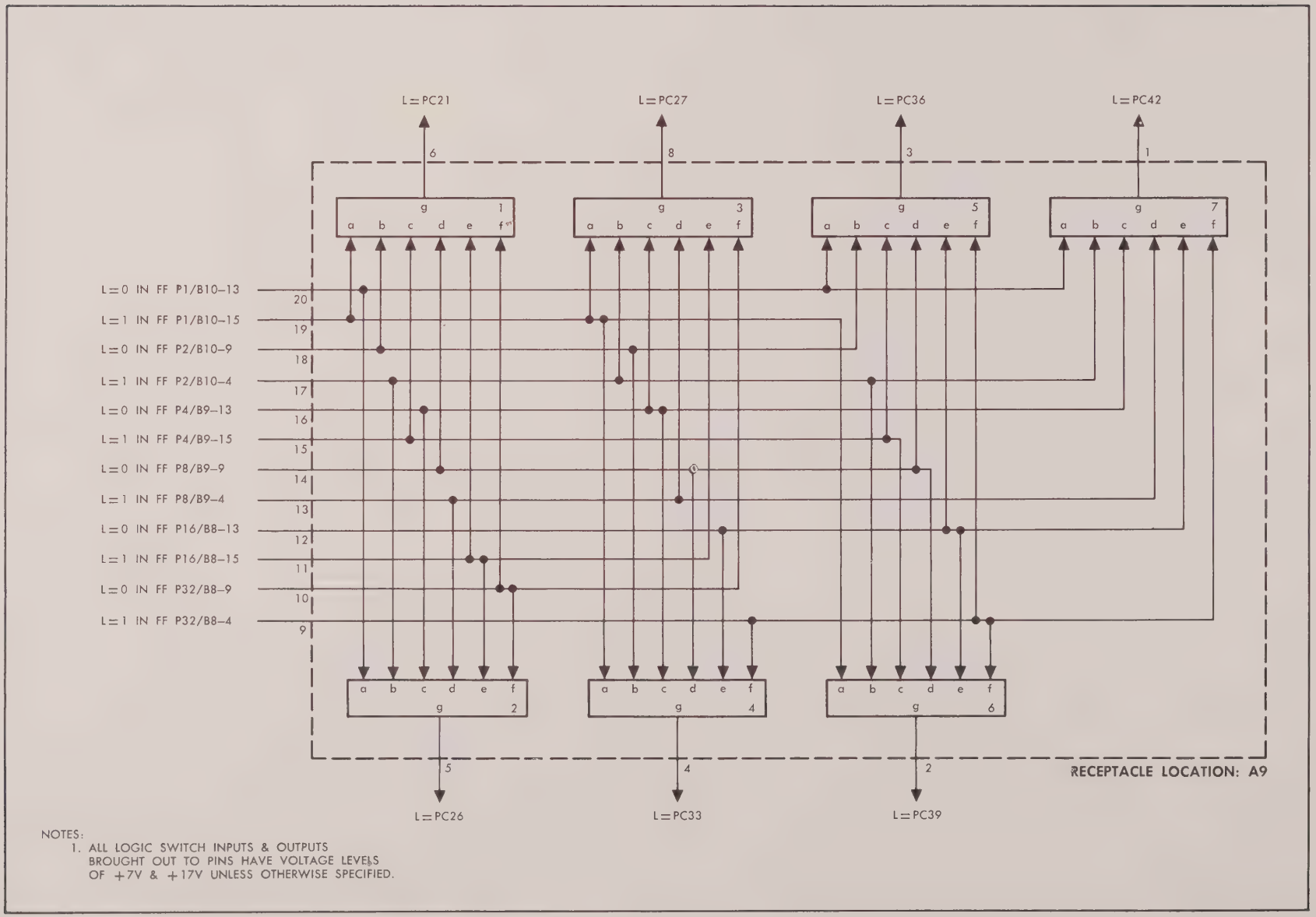


Figure 4–13. Block Diagram: Program Counter



NOTES:
1. ALL LOGIC SWITCH INPUTS & OUTPUTS BROUGHT OUT TO PINS HAVE VOLTAGE LEVELS OF +7V & +17V UNLESS OTHERWISE SPECIFIED.

Figure 4–14. Block Diagram: Program Logic Matrix Circuits; Program Count 21 through 42.

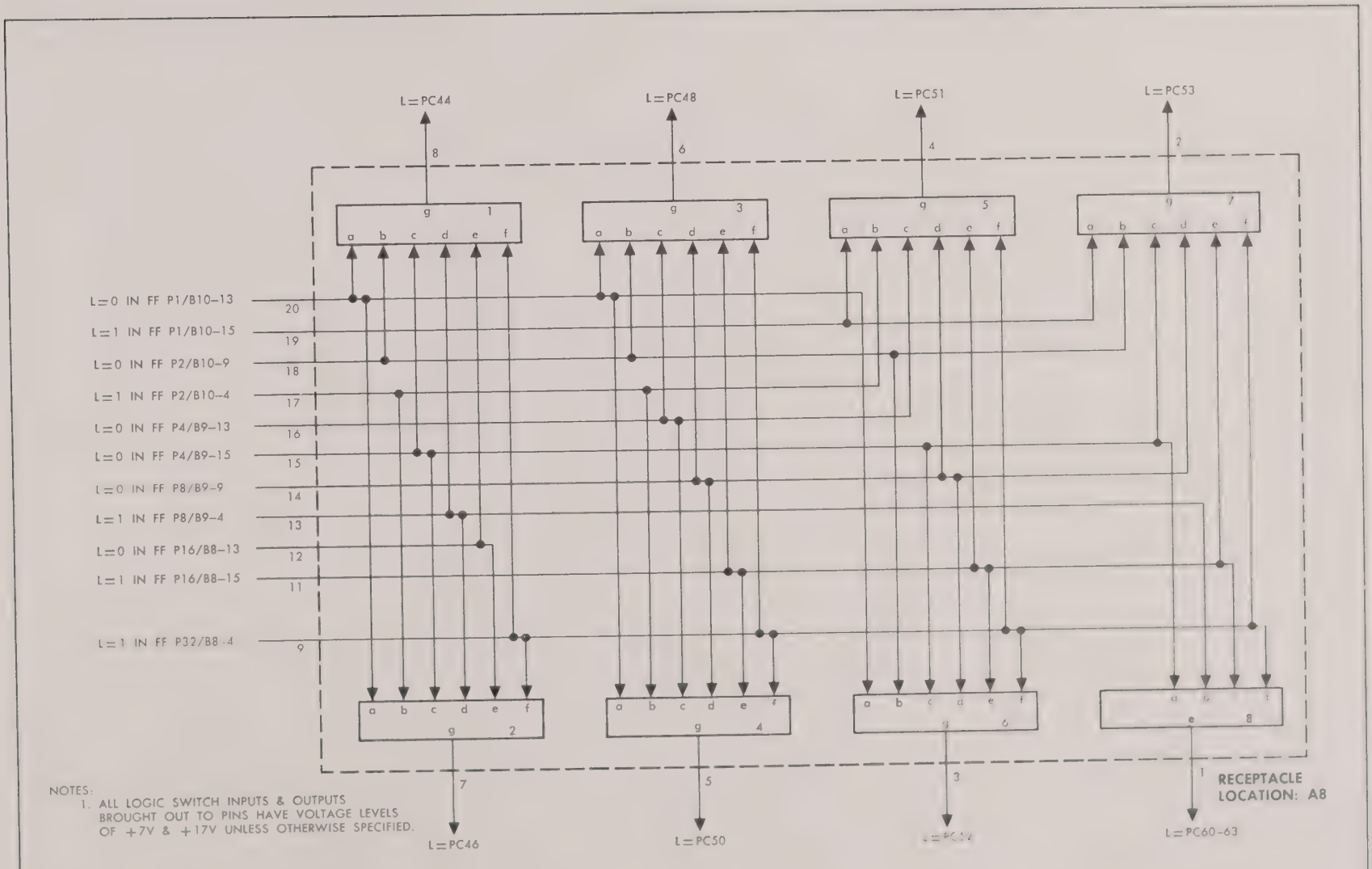


Figure 4–15. Block Diagram: Program Logic Matrix Circuits; Program Count 44 through 53, and 60-63

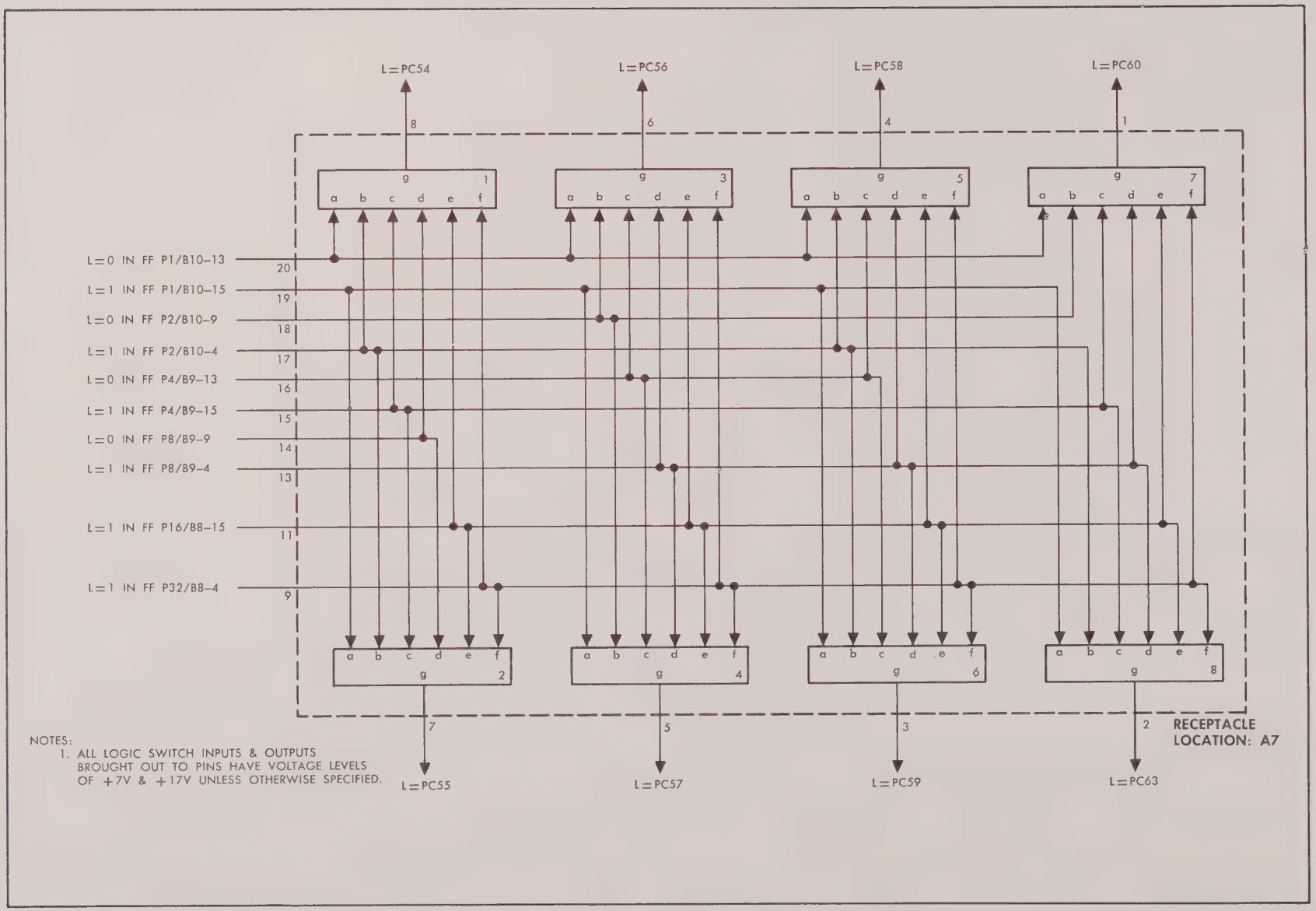


Figure 4–16. Block Diagram: Program Logic Matrix Circuits; Program Count 54 through 63.

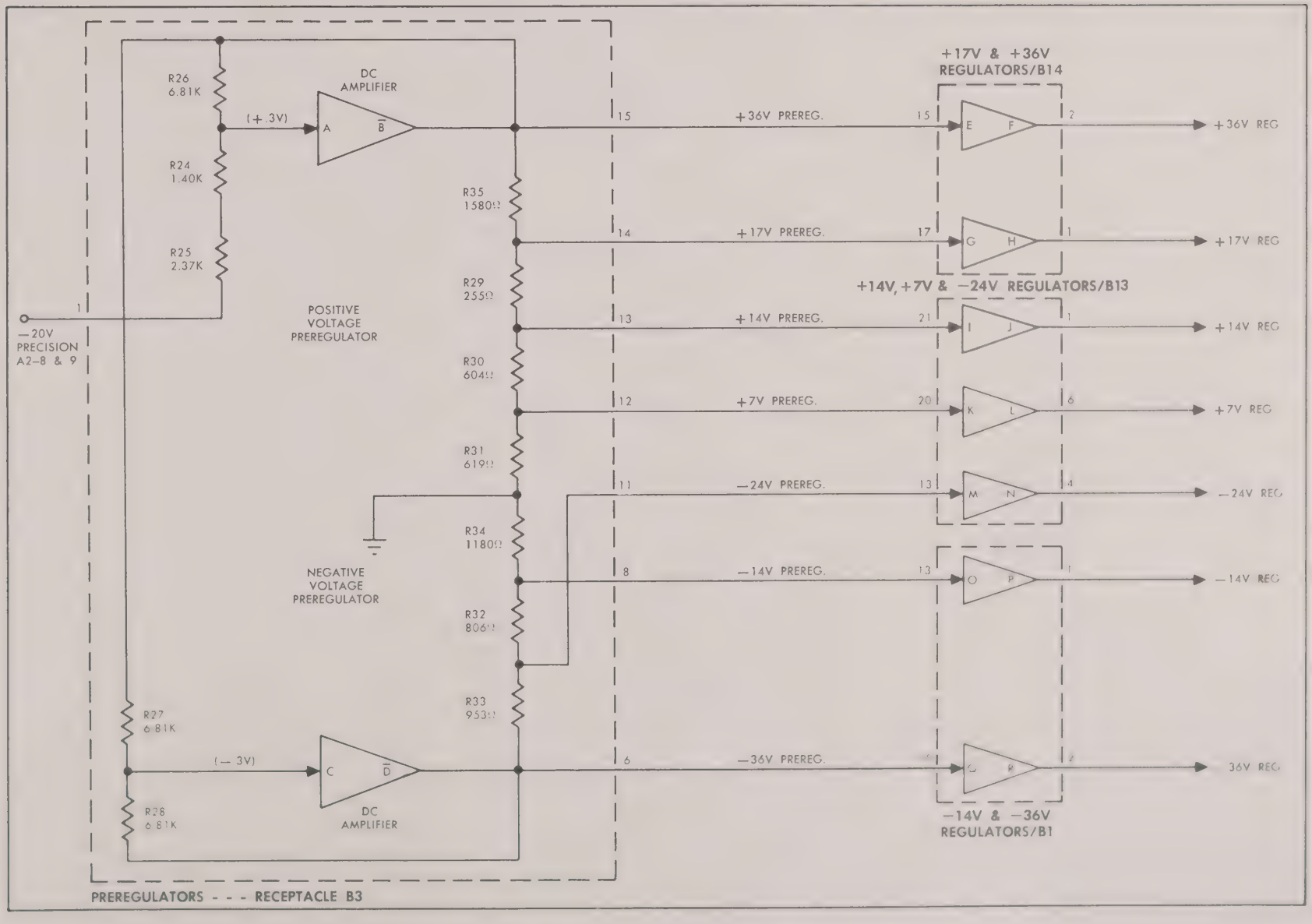


Figure 4–17. Block Diagram: Preregulated and Regulated Power Supplies.

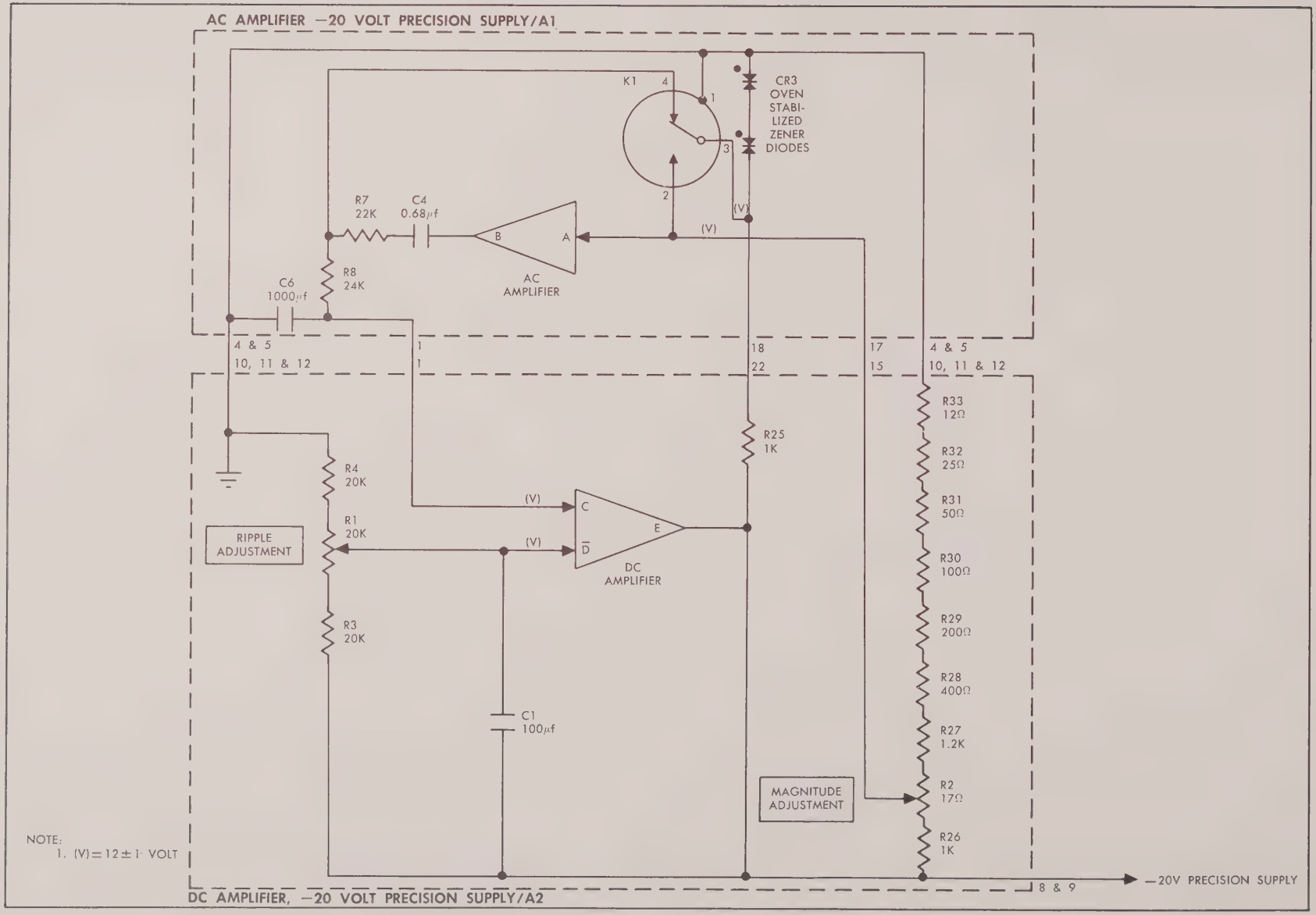


Figure 4–18. Simplified Diagram: Precision Supply, —20 Volt.

FOR THESE RANGE CONTROL SETTINGS ↓ / THE LETTER "E" INDICATES WHICH OF THESE ITEMS IS ENERGIZED →	RANGE RELAY K2–A16	RANGE RELAY K3–A16	10 V. DECIMAL POINT LAMP	100 V. DECIMAL POINT LAMP	1000 V. DECIMAL POINT LAMP	"AC" LAMP	LAMP OR LAMP
10V.DC			E				E
100V DC	E			E			E
1000V.DC	E	E			E		E
10V AC			E			E	
100V.AC				E		E	
1000V.AC					E	E	
AUTO. AC RANGING			*	*	*	E	

*ON AUTO AC RANGING, THE RANGE AUTOMATICALLY SELECTED BY THE CONVERTER DETERMINES WHICH DECIMAL POINT LAMP IS ENERGIZED.

Table 4–1. Range Selection Data.

INPUT A	INPUT b	OUTPUT C
LOW	LOW	LOW
LOW	HIGH	LOW
HIGH	LOW	HIGH
HIGH	HIGH	LOW

Table 4–2. Input-output Relations for Logic Switching Circuit 6 (or 7) as shown in Figure 4–3

DECIMAL NUMBER	STATE OF FLIP FLOP 2	STATE OF FLIP FLOP 4	STATE OF FLIP FLOP 2*	STATE OF FLIP FLOP 1
0	0	0	0	0
1	0	0	0	1
2	1	0	0	0
3	1	0	0	1
4	1	0	1	0
5	1	0	1	1
6	1	1	0	0
7	1	1	0	1
8	1	1	1	0
9	1	1	1	1

Table 4–3. Binary Code used in the V44 Digital Voltmeter.

INPUT a OF LOGIC SWITCH 1	INPUT b OF LOGIC SWITCH 1	INPUT a OF LOGIC SWITCH 2	INPUT b OF LOGIC SWITCH 2	OUTPUT C OF LOGIC SWITCH 1, AND INPUT a OF LOGIC SWITCH 9	OUTPUT C OF LOGIC SWITCH 2, AND INPUT b OF LOGIC SWITCH 9	OUTPUT c OF LOGIC SWITCH 9
LOW	LOW	HIGH	HIGH	HIGH	LOW	HIGH
LOW	HIGH	HIGH	LOW	LOW	LOW	LOW
HIGH	LOW	LOW	HIGH	LOW	LOW	LOW
HIGH	HIGH	LOW	LOW	LOW	HIGH	HIGH

Table 4–4. Input-output Relations Among Logic Switching Circuits 1, 2, and 9 as shown in Figure 4–10.

OTHER OPERATIONS PERFORMED	DECADE FLIP-FLOP SET TO 0 IF THERE IS A DOWN PULSE	DECADE FLIP-FLOPS SET TO 1	STATE OF COUNTER FLIP-FLOP P1	STATE OF COUNTER FLIP-FLOP P2	STATE OF COUNTER FLIP-FLOP P4	STATE OF COUNTER FLIP-FLOP P8	STATE OF COUNTER FLIP-FLOP P16	STATE OF COUNTER FLIP-FLOP P32	PROGRAM COUNT
COUNTER JUMPS TO PROGRAM COUNT 17			0	0	0	0	0	0	0
CHOPPER DRIVE FLIP-FLOP C2 IS SET TO "OPERATE"			1	0	1	0	1	0	21
CHOPPER DRIVE FLIP-FLOP C1 IS SET TO "OPERATE"			0	1	0	1	1	0	26
ALL DECADE FLIP-FLOPS ARE SET TO 0. POLARITY FLIP-FLOP IS SET TO PLUS.			1	1	0	1	1	0	27
IF A DOWN PULSE IS PRESENT, POLARITY FLIP-FLOP IS SET TO MINUS.		D1000–4 D1000–2	1	0	0	0	0	1	33
	D1000–4	D1000–2*	0	0	1	0	0	1	36
	D1000–2*		1	1	1	0	0	1	39
IF A DOWN PULSE IS PRESENT, AND IF FLIP-FLOPS D1000–2* AND D1000–4 ARE BOTH SET TO 0, THEN FLIP-FLOP D1000–2 IS SET TO 0.		D1000–1	0	1	0	1	0	1	42
	D1000–1	D100–4 D100–2	0	0	1	1	0	1	44
	D100–4	D100–2*	0	1	1	1	0	1	46
	D100–2*		0	0	0	0	1	1	48
IF A DOWN PULSE IS PRESENT, AND IF FLIP-FLOPS D100–2* AND D100–4 ARE BOTH SET TO 0, THEN FLIP-FLOP D100–2 IS SET TO 0.		D100–1	0	1	0	0	1	1	50
	D100–1	D10–4 D10–2	1	1	0	0	1	1	51
	D10–4	D10–2*	0	0	1	0	1	1	52
	D10–2*		1	0	1	0	1	1	53
IF A DOWN PULSE IS PRESENT, AND IF FLIP FLOPS D10–2* AND D10–4 ARE BOTH SET TO 0, THEN FLIP-FLOP D10–2 IS SET TO 0.		D10–1	0	1	1	0	1	1	54
	10–1	D1–4 D1–2	1	1	1	0	1	1	55
	D1–4	D1–2*	0	0	0	1	1	1	56
	D1–2*		1	0	0	1	1	1	57
IF A DOWN PULSE IS PRESENT, AND IF FLIP-FLOPS D1–4 AND D1–2* ARE BOTH SET TO 0, THEN FLIP-FLOP D1–2 IS SET TO 0.		D1–1	0	1	0	1	1	1	58
	D1–1		1	1	0	1	1	1	59
IF FLIP-FLOP D1–1 IS SET TO 1, AND HYSTERESIS FLIP-FLOP H1 IS SET TO 0, THEN THE STATE OF HYSTERESIS FLIP-FLOP H2 IS CHANGED. CHOPPER DRIVE FLIP-FLOP C1 IS SET TO "RESTORE" LONG AND SHORT RECORD PULSES ARE GENERATED			0	0	1	1	1	1	60
CHOPPER DRIVE FLIP-FLOP C1 IS SET TO "RESTORE"			1	0	1	1	1	1	61
CHOPPER DRIVE FLIP FLOP C1 IS SET TO "RESTORE"			0	1	1	1	1	1	62
CHOPPER DRIVE FLIP-FLOPS C1 & C2 ARE SET TO "RESTORE." HYSTERESIS FLIP-FLOP H1 IS SET SO THAT ITS STATE AGREES WITH FLIP-FLOP D1–1.			1				1	1	63

Table 4–5. Program of the V44 Digital Voltmeter.

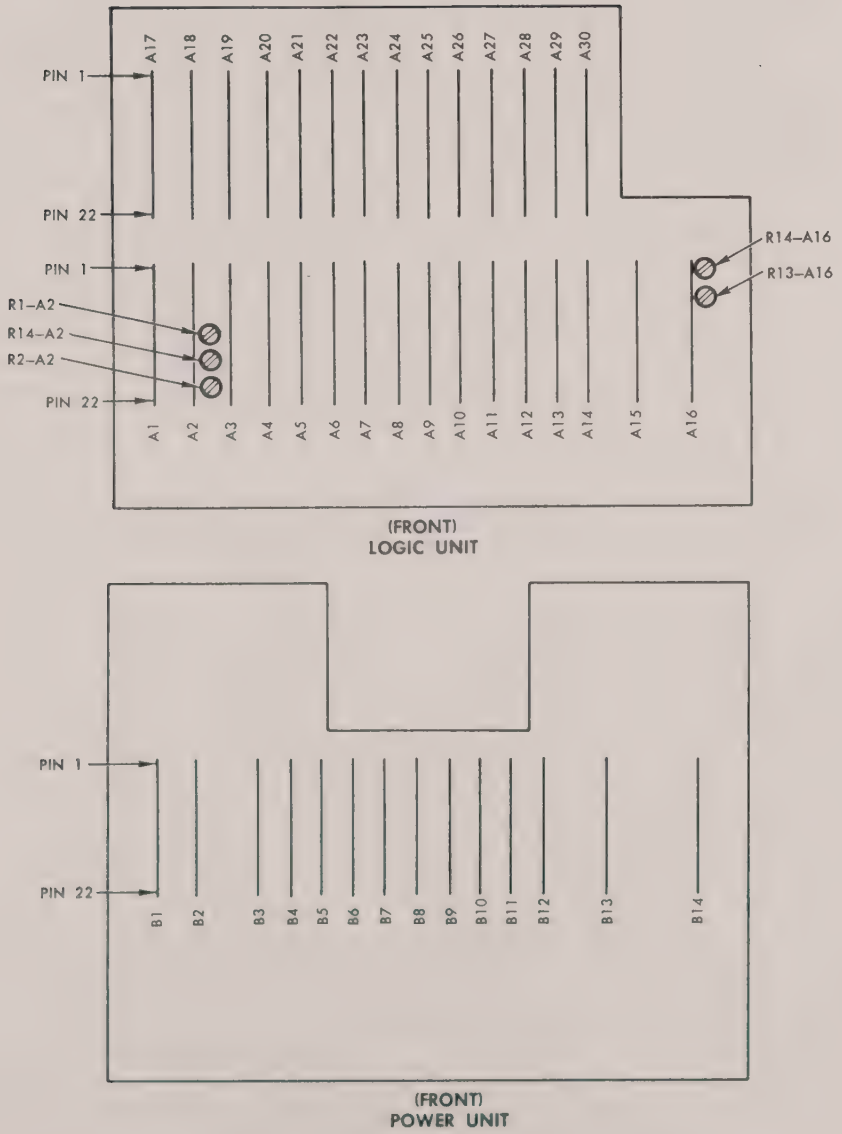


Figure 5–1. Plug-in Board and Adjustment Locations as Viewed from Top of Baseboards.

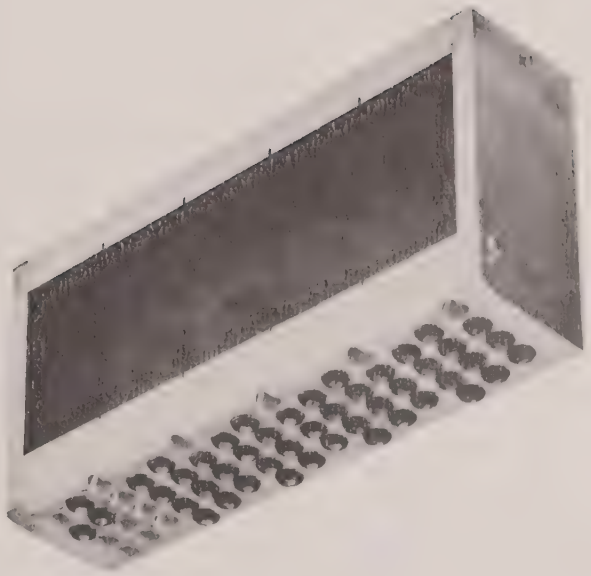


Figure 5-2. Readout, Showing Bulbs Correctly Installed.

PARTS LISTS AND SCHEMATICS

The following pages show the individual plug-in boards used in the V44 Digital Voltmeter. The left-hand page provides an illustrated parts listing; the right-hand page is the schematic drawing for the board.

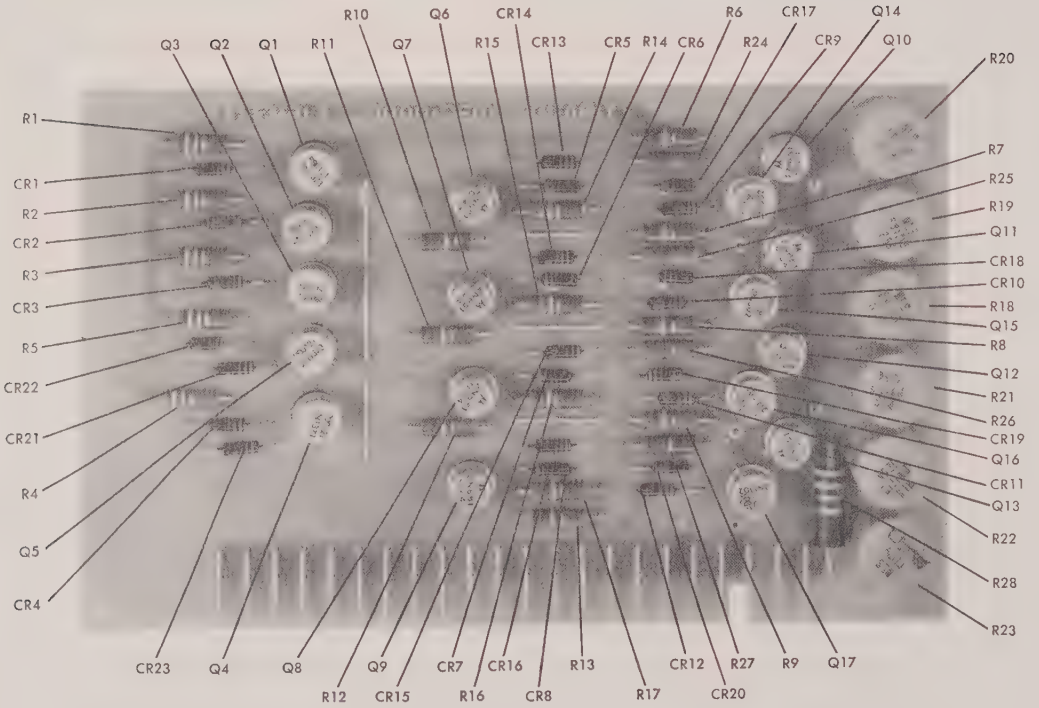
NLS offers a spares and service kit which provides the most convenient maintenance package for the V44 Digital Voltmeter. This kit provides spare parts to maintain one V44 Digital Voltmeter for one year. See Figure 6-1 below.

MODEL V44 SPARE PARTS KIT, P/N 28000-200

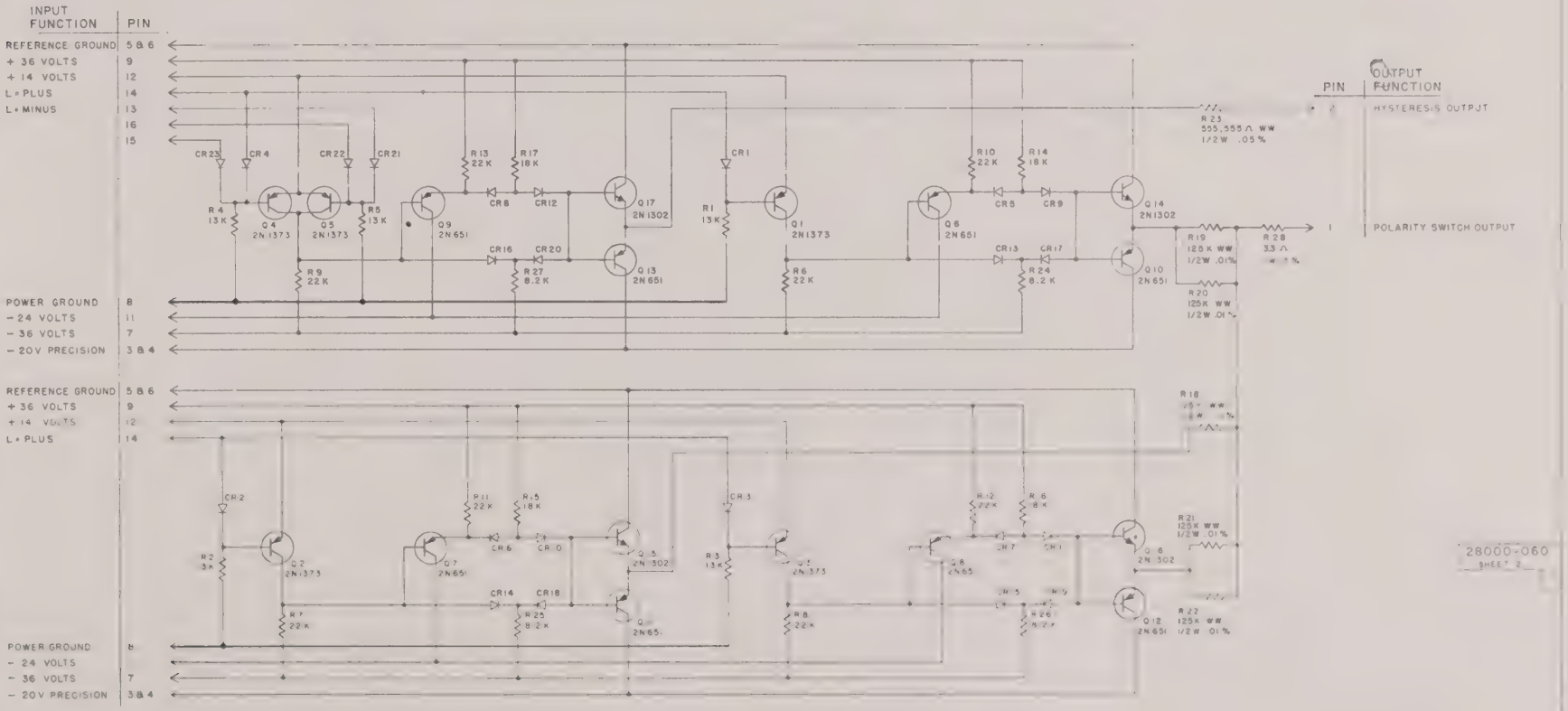
PART NUMBER	DESCRIPTION	QTY PER UNIT
28000-060	POLARITY SWITCH ASSEMBLY	1
28000-061	DECADE SWITCH ASSEMBLY	2
28000-086	DECADE FLIP-FLOP ASSEMBLY	2
28000-084	POLARITY FLIP-FLOP ASSEMBLY	1
28000-130	AC AMPLIFIER, −20V Precision Supply	1
28000-125	DC AMPLIFIER, −20V Precision Supply	1
28000-064	DECADE DECODE ASSEMBLY	1
28000-065	LOGIC MATRIX ASSEMBLY, PC 21 thru 42	1
28000-066	LOGIC MATRIX ASSEMBLY, PC 44 thru 53 and 60-63	1
28000-067	LOGIC MATRIX ASSEMBLY, PC 54 thru 63	1
28000-069	COUNTER FLIP-FLOP & CHOPPER DRIVE ASSEMBLY	1
28000-070	SYNC FLIP-FLOP ASSEMBLY	1
28000-112	FAST MULTIVIBRATOR & TRIGGERING ASSEMBLY	1
28000-072	HYSTERESIS FLIP-FLOP ASSEMBLY	1
28000-102	AMPLIFIER ASSEMBLY	1
28000-076	RANGE ASSEMBLY	1
28000-091	+17V & +36V REGULATOR ASSEMBLY	1
28000-097	+7V, +14V & −24V REGULATOR ASSEMBLY	1
28000-099	ONE SHOT & SLOW MULTIVIBRATOR ASSEMBLY	1
28000-068	COUNTER MATRIX ASSEMBLY	1
28000-110	CONVERTER ADAPTER ASSEMBLY	1
28000-095	PREREGULATED VOLTAGE ASSEMBLY	1
28000-093	FUSE & RECTIFIER BOARD ASSEMBLY	1
28000-096	−14V & −36V REGULATOR ASSEMBLY	1
330	LAMP, READOUT	6
12110-004	CONTACT, READOUT	6
5751	TUBE, TRIODE	1
98486	CHOPPER ONLY (Minus Socket & Cover)	1
313-002	FUSE, 3 AG, 2 AMP, Slo Blo	2

Figure 6-1 Spares and Service Kit

28000-060 POLARITY SWITCH ASSEMBLY



CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
R28	Coml'	RESISTOR, 3.3 Ohms, 1 Watt, 5% (Composition)	1	Allen Bradley
R24 thru R27	Com'l	RESISTOR, 8.2K, 1/2 Watt, 5% (Composition)	4	Allen Bradley
R23	PW1719	RESISTOR, 555,555 Ohms, 1/2 Watt, .05% WW	1	NLS
R18 thru R22	PW1719	RESISTOR, 125K, 1/2W, 01%, WW	5	NLS
R14 thru R17	Com'l	RESISTOR, 18K, 1/2W, 5% (Composition)	4	Allen Bradley
R6 thru R13	Com'l	RESISTOR, 22K, 1/2W, 5% (Composition)	8	Allen Bradley
R1 thru R5	Com'l	RESISTOR, 13K, 1/2W, 5% (Composition)	5	Allen Bradley
CR1 thru CR23	1N625	DIODE	23	Hughes
Q14 thru Q17	2N1302	TRANSISTOR, NPN	4	Texas Instruments
Q6 thru Q13	2N651	TRANSISTOR, PNP	8	Motorola
Q1 thru Q5	2N1373	TRANSISTOR, PNP	5	Texas Instruments



28000-060
SHEET 2

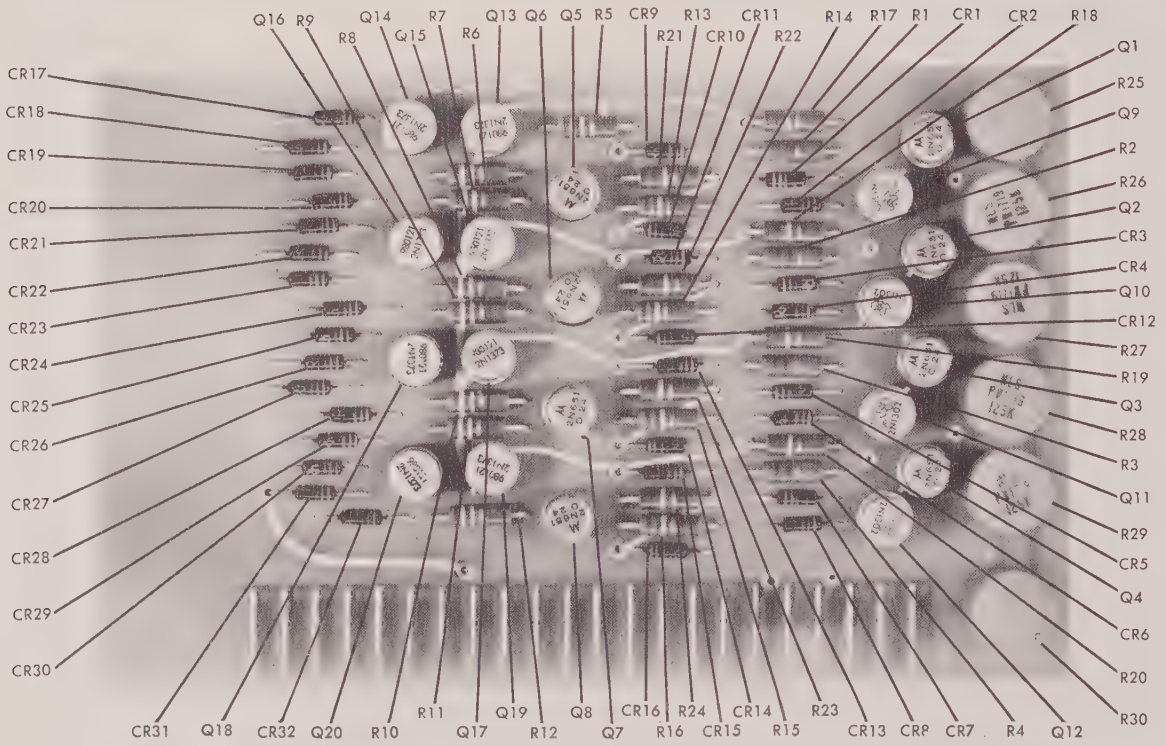
2 ALL DIODES ARE IN625
1 ALL RESISTORS ARE CARBON, 1/2W, 5%
NOTES UNLESS OTHERWISE SPECIFIED

SCHEMATIC - POLARITY SWITCH

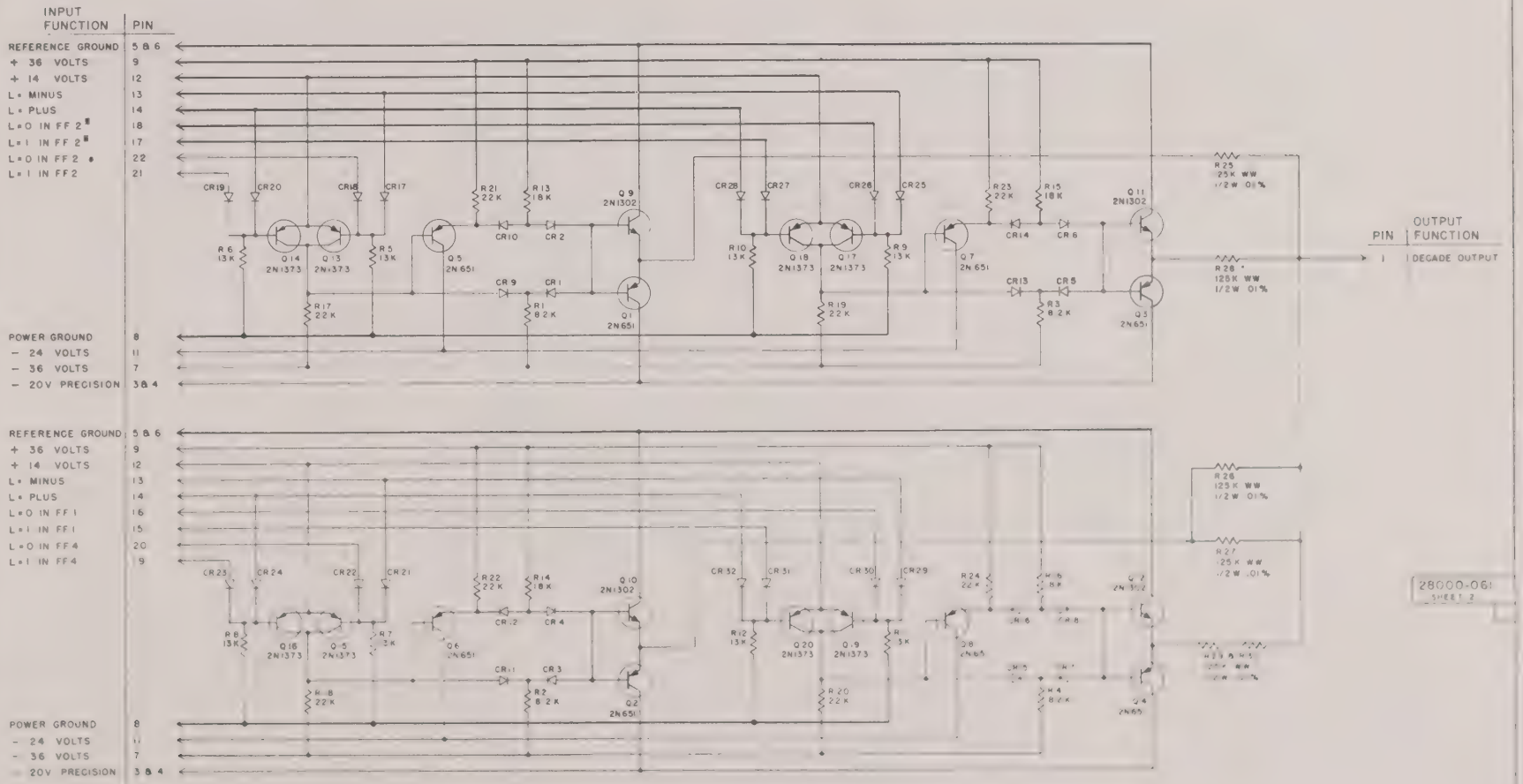
MODEL 744

NLS NON LINEAR SYSTEMS INC

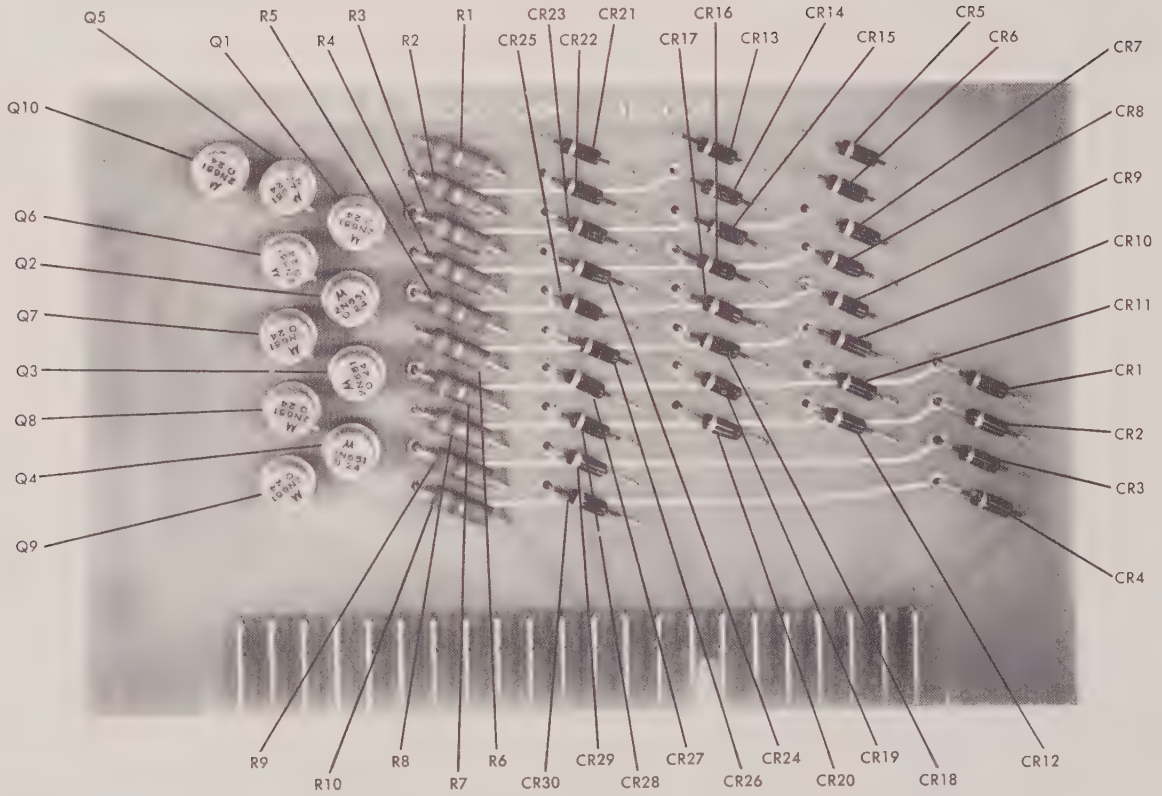
28000-061 DECADE SWITCH ASSEMBLY



CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
Q13 thru Q20	2N1373	TRANSISTOR	8	Texas Instruments
Q9 thru Q12	2N1302	TRANSISTOR	4	Texas Instruments
Q1 thru Q8	2N651	TRANSISTOR	8	Motorola
CR1 thru CR32	1N625	DIODE, SILICON	32	Hughes
R25 thru R30	PW1719	RESISTOR, 125K, .01%, 1/2W, WW	6	NLS
R17 thru R24		RESISTOR, 22K, 5%, 1/2W (Composition)	8	Allen Bradley
R13 thru R16		RESISTOR, 18K, 5%, 1/2W (Composition)	4	Allen Bradley
R5 thru R12		RESISTOR, 13K, 5%, 1/2W (Composition)	8	Allen Bradley
R1 thru R4		RESISTOR, 8.2K, 1/2W, 5% (Composition)	4	Allen Bradley

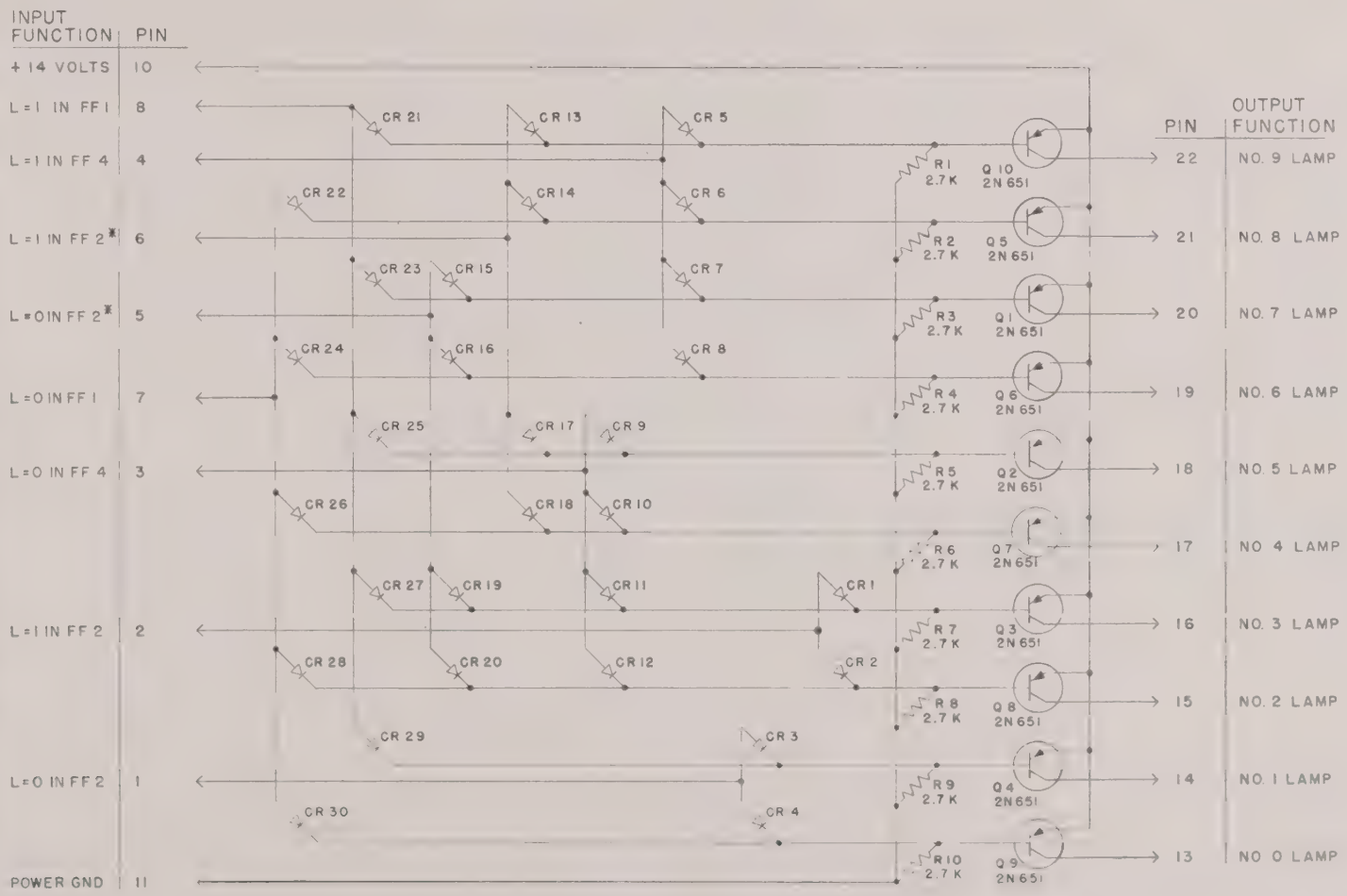

INPUT FUNCTION
PIN
REFERENCE GROUND 5 & 6
+ 36 VOLTS 9
+ 14 VOLTS 12
L = MINUS 13
L = PLUS 14
L = 0 IN FF 2 18
L = 1 IN FF 2 17
L = 0 IN FF 2 22
L = 1 IN FF2 21
POWER GROUND 8
- 24 VOLTS 11
- 36 VOLTS 7
- 20V PRECISION 3 & 4
REFERENCE GROUND 5 & 6
+ 36 VOLTS 9
+ 14 VOLTS 12
L = MINUS 13
L = PLUS 14
L = 0 IN FF 1 16
L = 1 IN FF 1 15
L = 0 IN FF 4 20
L = 1 IN FF 4 9
POWER GROUND 8
- 24 VOLTS 11
- 36 VOLTS 7
- 20V PRECISION 3 & 4
OUTPUT FUNCTION
PIN
1 DECADE OUTPUT
28000-061
SHEET 2
SCHEMATIC - DECADE SWITCH
MODEL V44
NLS NON LINEAR SYSTEMS INC
28000-061
2
2 ALL DIODES ARE IN 625
1 ALL RESISTORS ARE 1/2 W, CARBON, 5 %
NOTES UNLESS OTHERWISE SPECIFIED

28000-064 DECADE DECODE ASSEMBLY



CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
Q1 thru Q10	2N651	TRANSISTOR	10	Motorola
CR1 thru CR30	5003-002	DIODE, SILICON	30	NLS
R1 thru R10		RESISTOR, 2.7K, 5%, 1/2W (Composition)	10	Allen Bradley

REVISIONS				
SYM	EFFECT	DESCRIPTION	DATE	APPROVAL



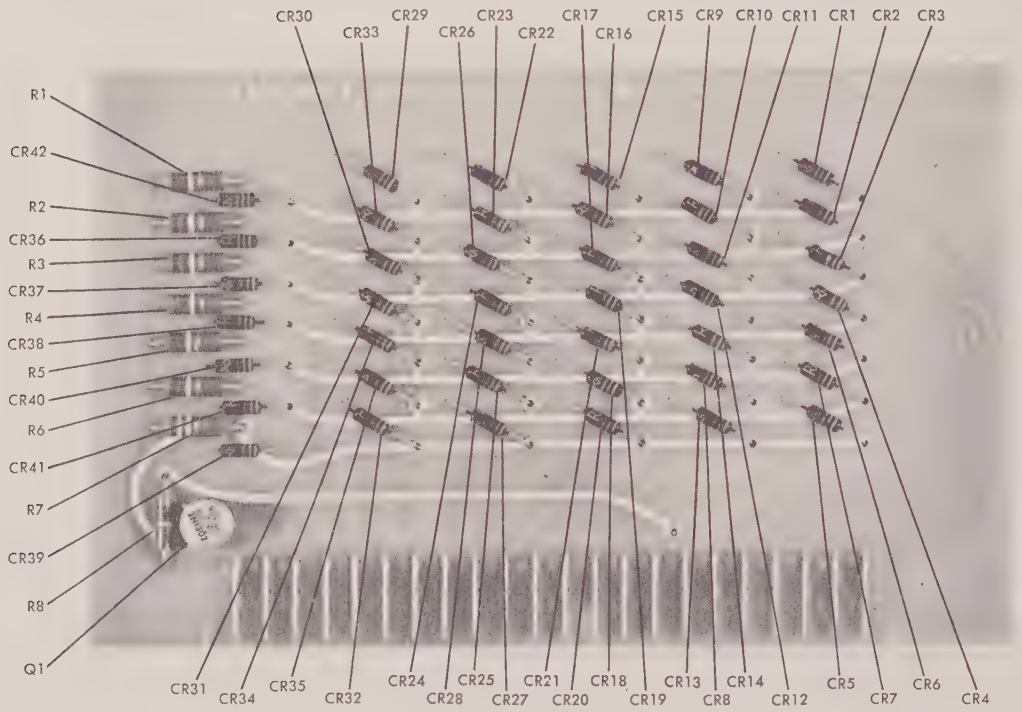
28000-064
SHEET 2

NEXT ASSY	USED ON	NEXT ASSY	FINAL ASSY
APPLICATION		QTY REQD	

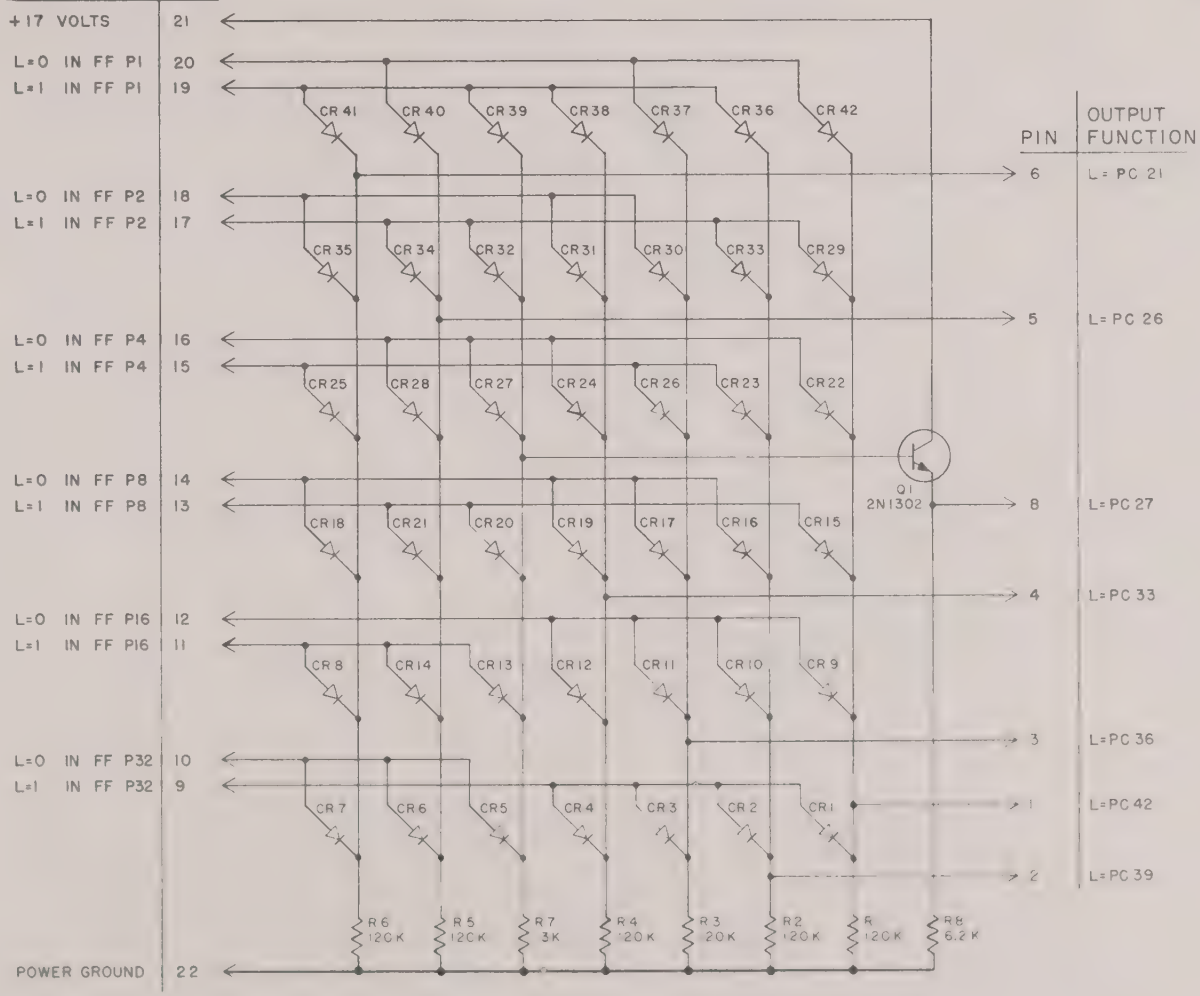
2. ALL DIODES ARE STC 180
1. ALL RESISTORS ARE CARBON, 1/2 W, 5%
NOTES: UNLESS OTHERWISE SPECIFIED

MATERIAL	SHACK-ETON 2-22-61	SCHEMATIC - DECADE DECODER	NON-LINEAR SYSTEMS INC DEL MAR A BPORT DEL MAR CALIFORNIA
		MODEL V44	28000-064

28000-065 LOGIC MATRIX ASSEMBLY



CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
R8	Com'l	RESISTOR, 6.2K, 1/2W, 5% (Composition)	1	Allen Bradley
R7	Com'l	RESISTOR, 13K, 1/2W, 5% (Composition)	1	Allen Bradley
R1 thru R6	Com'l	RESISTOR, 120K, 1/2W, 5% (Composition)	6	Allen Bradley
CR1 thru CR42	1N625	DIODE	42	Hughes
Q1	2N1302	TRANSISTOR	1	Texas Instruments



28000-065
SHEET 2

NOTES. UNLESS OTHERWISE SPECIFIED

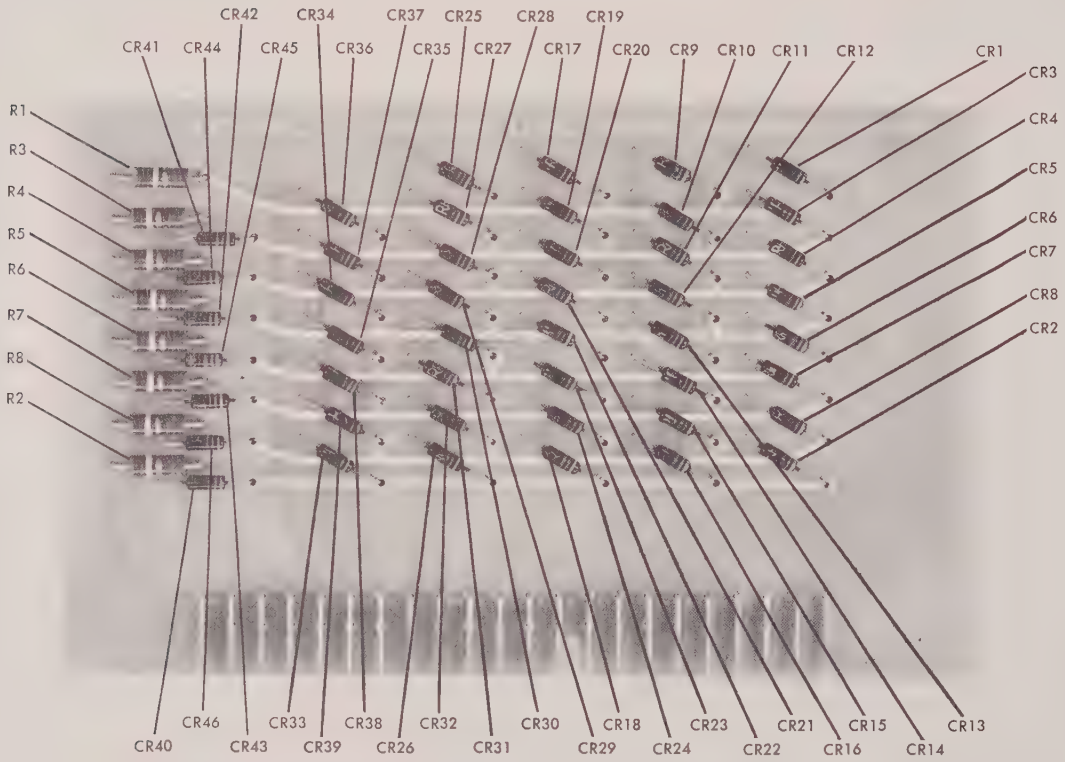
1. ALL RESISTORS ARE CARBON, 1/2W, 5%
2. ALL DIODES ARE IN 625

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTION DECIMAL ANGLES
MATERIAL

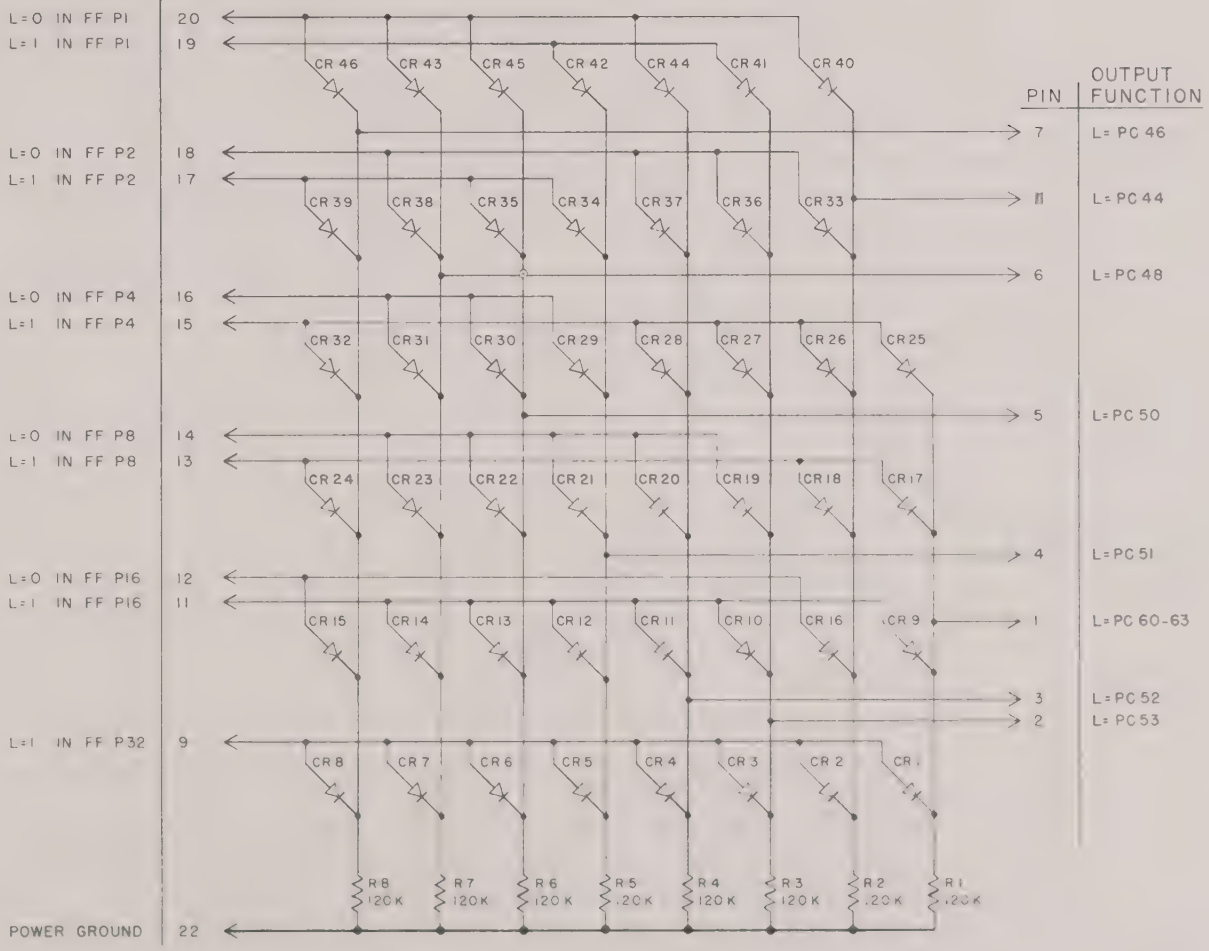
SCHEMATIC –
PROGRAM LOGIC MATRIX
PROGRAM COUNT 21 – 42
MODEL V44

NON-LINEAR SYSTEMS INC
DEL MAR CALIFORNIA

28000-065



CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
R1 thru R8	Com'l	RESISTOR, 120K, 1/2W, 5% (Composition)	8	Allen Bradley
CR1 thru CR46	1N625	DIODE	46	Hughes



REVISIONS

SYM	EFFECT	DESCRIPTION	DATE	APPROVAL

28000-066
SHEET 2

2. ALL DIODES ARE IN625
1. ALL RESISTORS ARE CARBON, 1/2W, 5 %
NOTES: UNLESS OTHERWISE SPECIFIED

APPLICATION	QTY REQ'D

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTION DECIMAL ANGLES
MATERIAL
FINISH

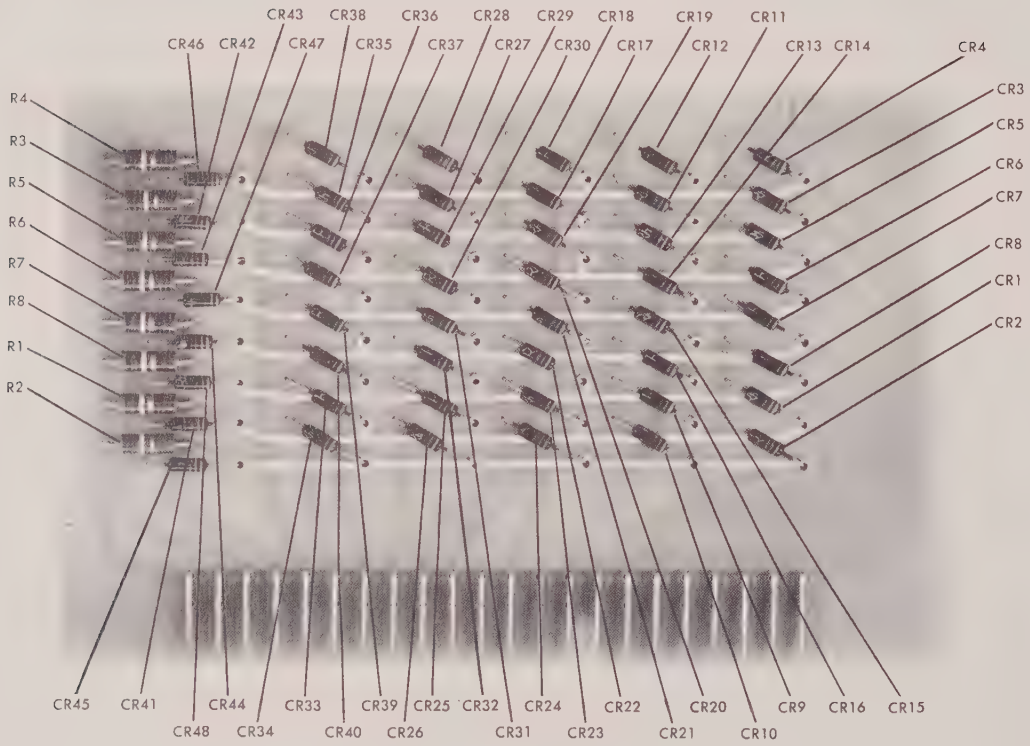
DRAWN BY SHACKLETON 6-12-61
CHECKED BY
APPROVED BY 1-21-61

TITLE
SCHEMATIC -
PROGRAM LOGIC MATRIX
PROGRAM COUNT 44 THRU 53 & 60-63
MODEL V44

NON-LINEAR SYSTEMS INC
DEL MAR AIRPORT
DEL MAR CALIFORNIA

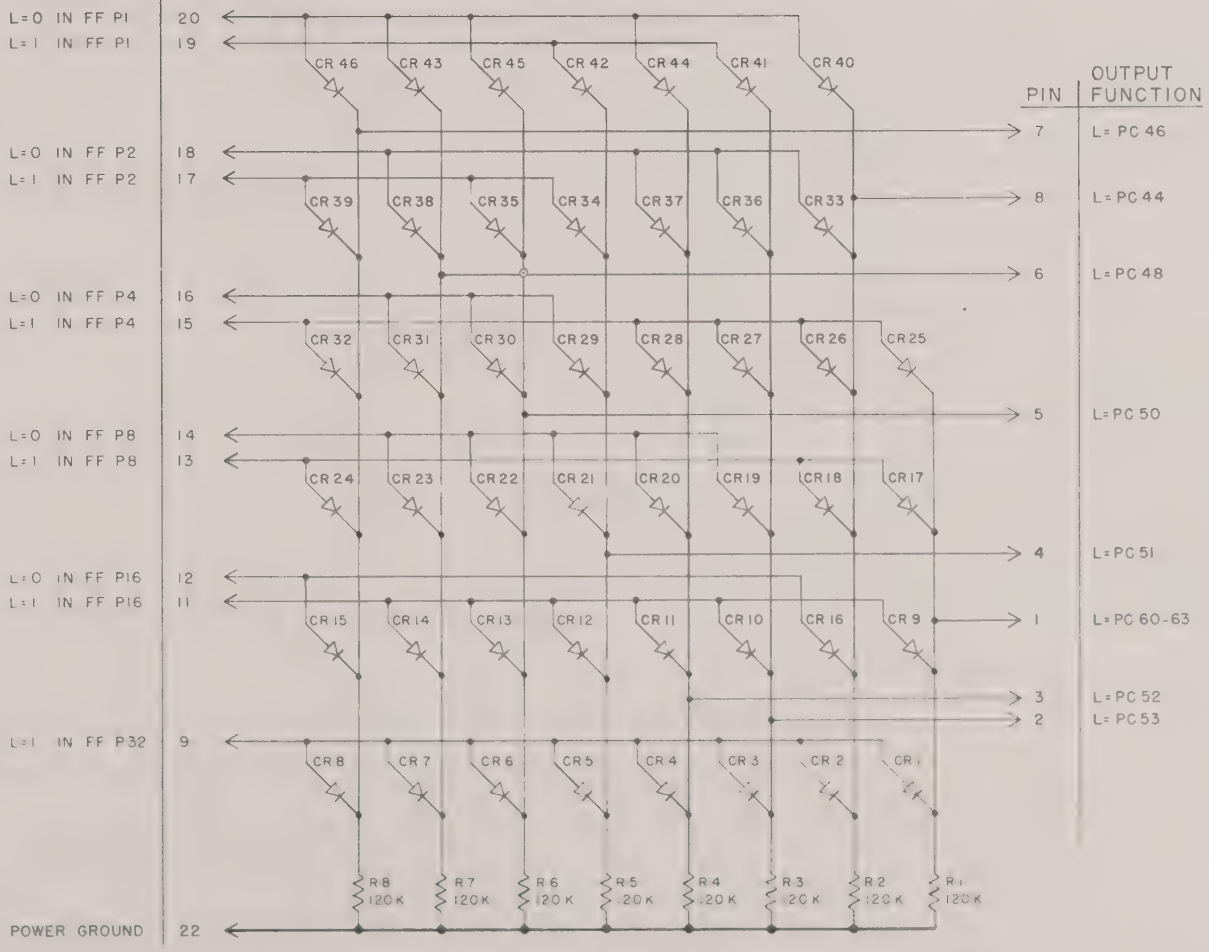
DRAWING NUMBER
28000-066

SCALE WT SHEET 2 OF



CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
R1 thru R8	Com'l	RESISTOR, 120K, 1/2W, 5% (Composition)	8	
CR1 thru CR48	1N625	DIODE, SILICON	48	Hughes

REVISIONS				
SYM	EFFECT	DESCRIPTION	DATE	APPROVAL



28000-066
SHEET 2

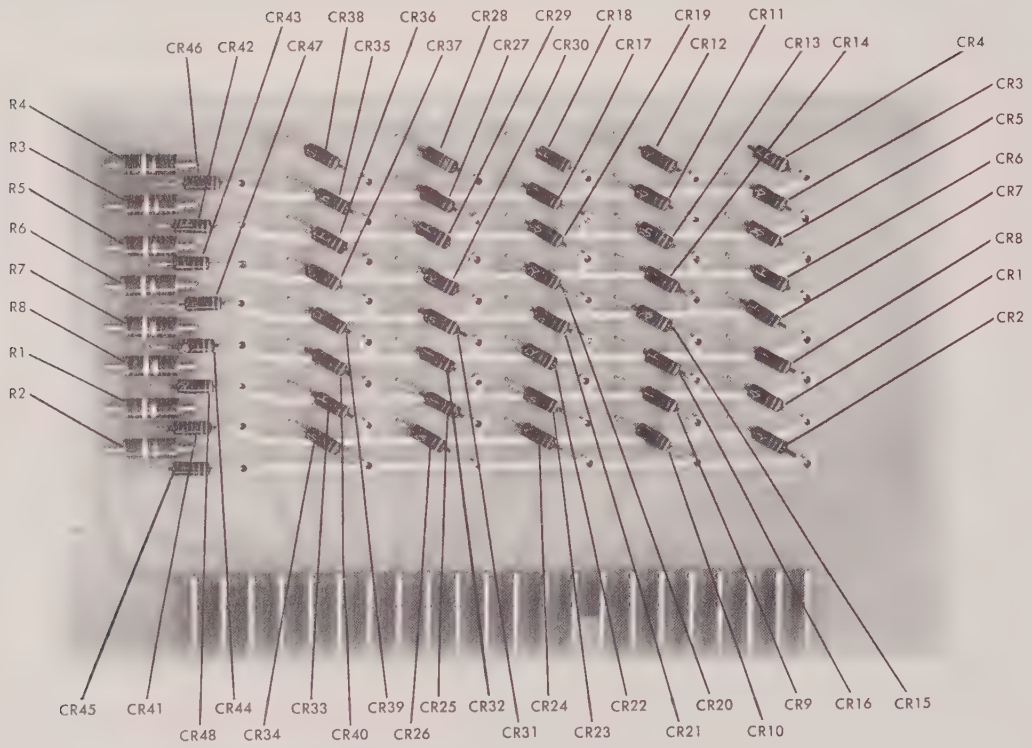
NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE CARBON, 1/2W, 5 %

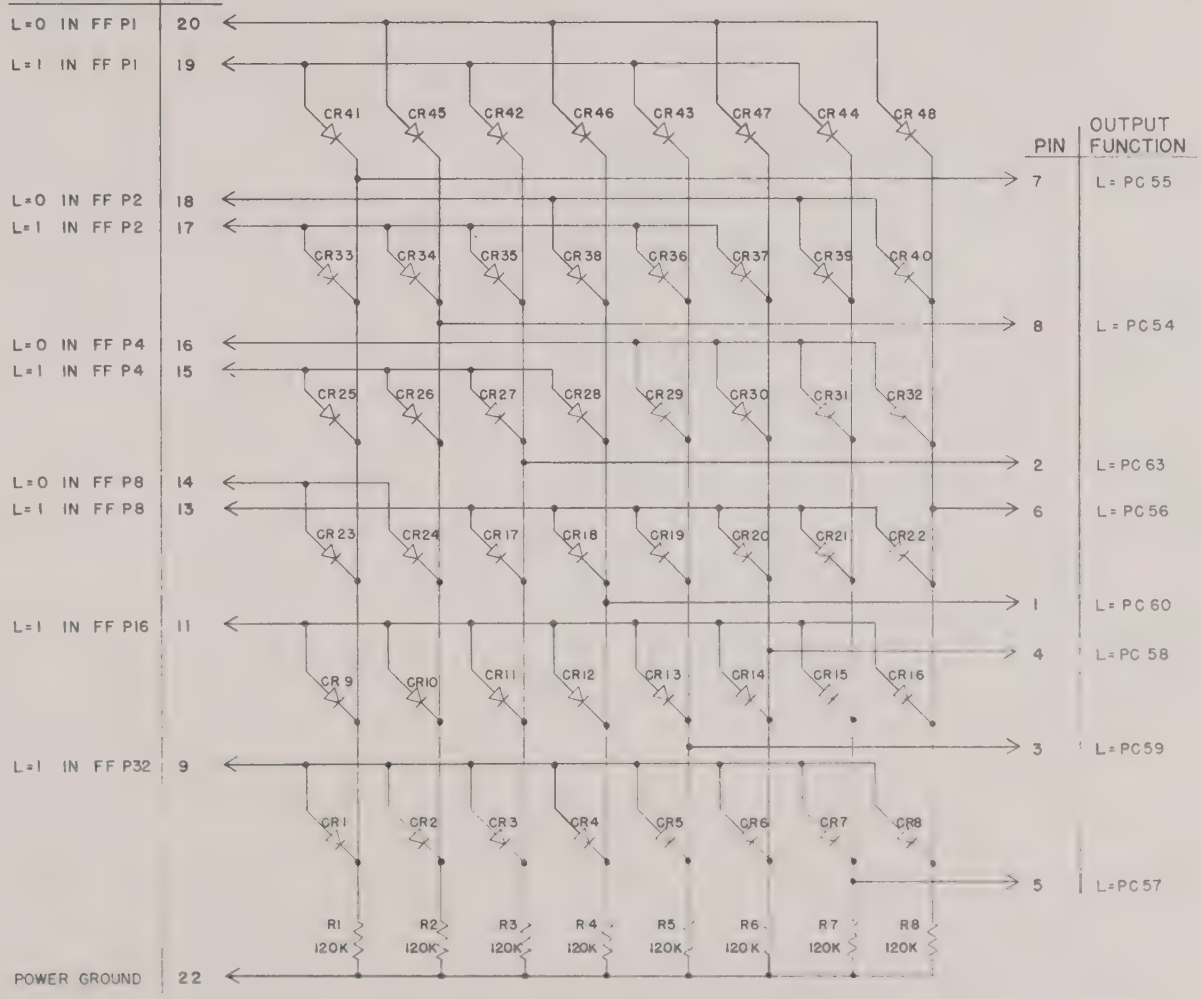
2. ALL DIODES ARE IN625

APPLICATION	QTY REQ'D

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES; TOLERANCES ON: FRACTION ± DECIMAL ± ANGLES ±	DRAWN SHACKLETON 6 12 6	TITLE: SCHEMATIC PROGRAM LOGIC MATRIX PROGRAM COUNT 44 THRU 53 & 60-63 MODEL V44	NON-LINEAR SYSTEMS INC DEL MAR AVEPOST DEL MAR CALIFORNIA
MATERIAL	FINISH	SCALE WT	DRAWING NUMBER 28000-066 SHEET 2 OF



CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
R1 thru R8	Com'l	RESISTOR, 120K, 1/2W, 5% (Composition)	8	
CR1 thru CR48	1N625	DIODE, SILICON	48	Hughes



REVISIONS

SYM.	APPROV.	DESCRIPTION	DATE	APPROVAL

28000-067
SHEET 2

NOTES UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE CARBON, 1/2 W, 5%
2. ALL DIODES ARE IN 625

NEXT ASSY	USED ON	APPLICATION	QTY REQD

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS ± DECIMAL ± ANGLES ±
MATERIAL
FINISH

DRAWN BY SOFIO DATE 6/12/61
CHECKED BY SHACKLETON DATE 7-21-61
APPROVED DATE 7-21-61

TITLE
SCHEMATIC-
PROGRAM LOGIC MATRIX
PROGRAM COUNT 54-63

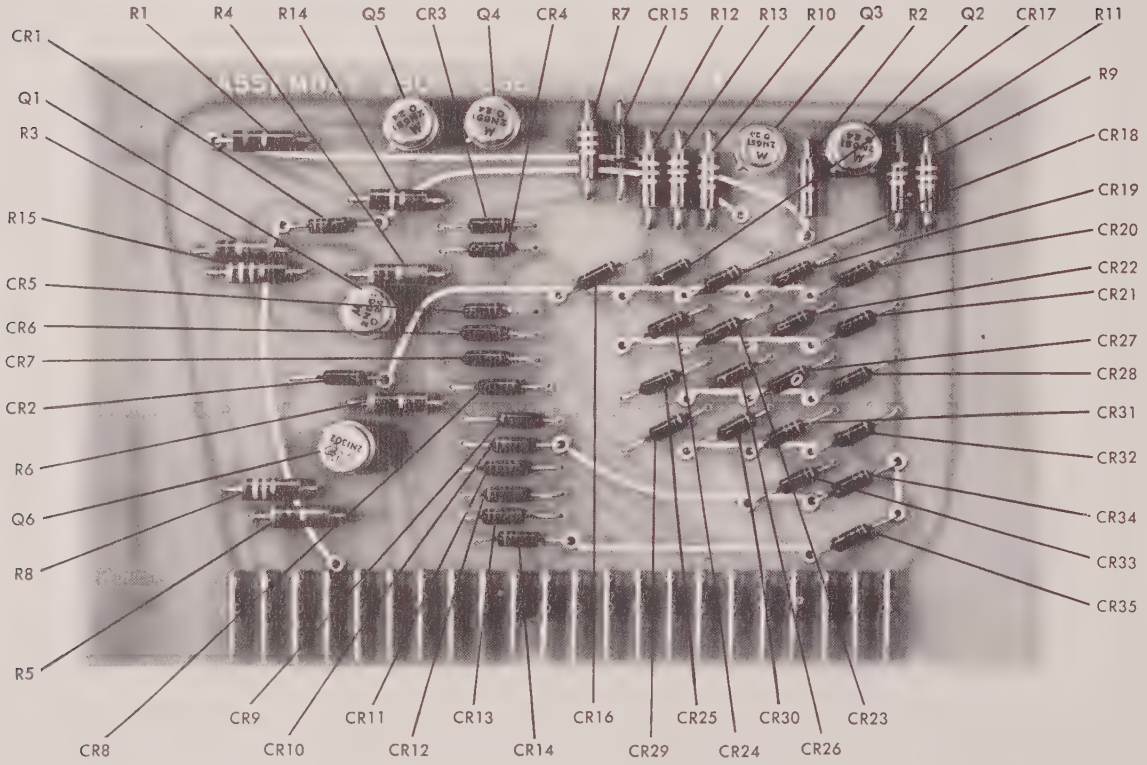
MODEL V44

SCALE WT

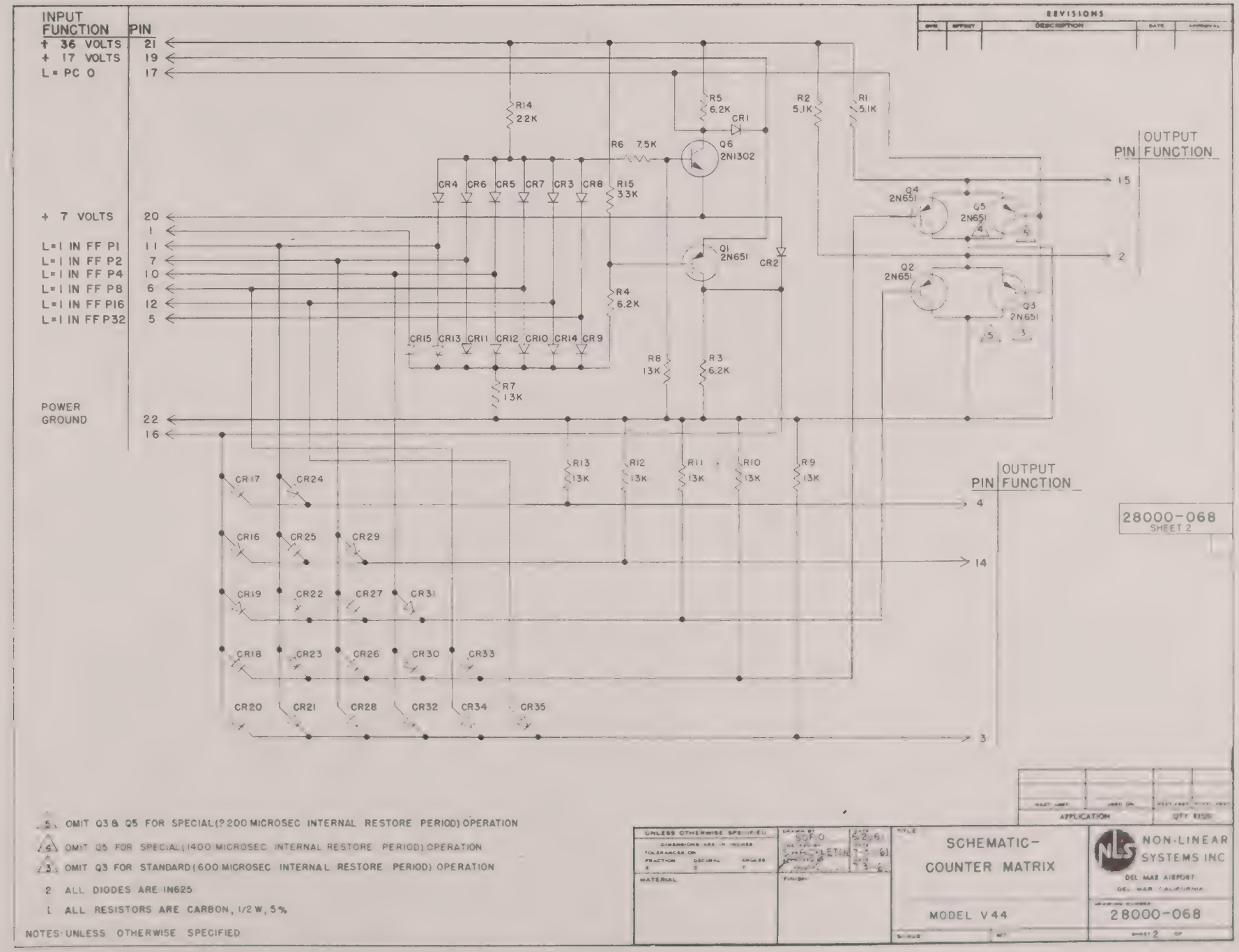
NON-LINEAR SYSTEMS INC
DEL MAR AIRPORT
DEL MAR CALIFORNIA

DRAWING NUMBER
28000-067

SHEET 2 OF



CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
R15	Com'l	RESISTOR, 33K, 1/2W, 5% (Composition)	1	Allen Bradley
R14	Com'l	RESISTOR, 22K, 1/2W, 5% (Composition)	1	Allen Bradley
R7 thru R13	Com'l	RESISTOR, 13K, 1/2W, 5% (Composition)	7	Allen Bradley
R6	Com'l	RESISTOR, 7.5K, 1/2W, 5% (Composition)	1	Allen Bradley
R3, R4, R5	Com'l	RESISTOR, 6.2K, 1/2W, .5% (Composition)	3	Allen Bradley
R1, R2	Com'l	RESISTOR, 5.1K, 1/2W, 5% (Composition)	2	Allen Bradley
CR1 thru CR35	1N625	DIODE	35	Hughes
Q6	2N1302	TRANSISTOR, NPN	1	Texas Instrument
Q1 thru Q5	2N651	TRANSISTOR, PNP	4	Motorola



28000-068
SHEET 2

/5\ OMIT Q3 & Q5 FOR SPECIAL (?200 MICROSEC INTERNAL RESTORE PERIOD) OPERATION

/4\ OMIT Q5 FOR SPECIAL (1400 MICROSEC INTERNAL RESTORE PERIOD) OPERATION

/3\ OMIT Q3 FOR STANDARD (600 MICROSEC INTERNAL RESTORE PERIOD) OPERATION

2 ALL DIODES ARE IN625

1 ALL RESISTORS ARE CARBON, 1/2 W, 5%

NOTES: UNLESS OTHERWISE SPECIFIED

APPLICATION	QTY REQD

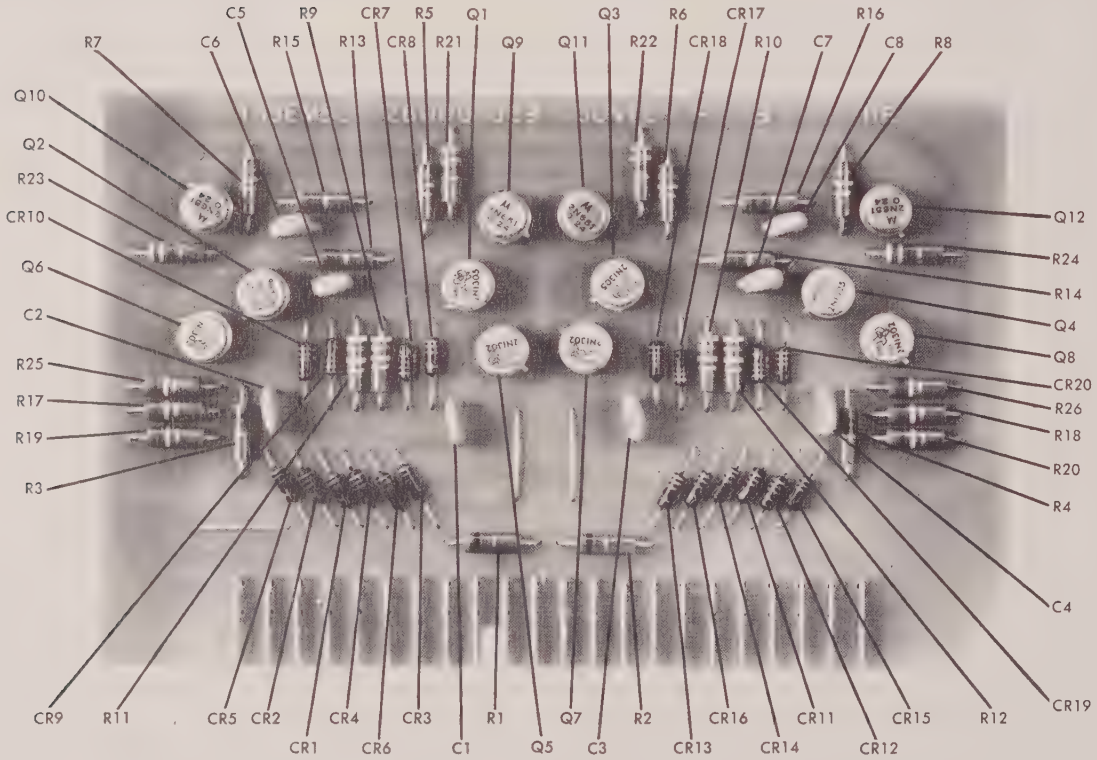
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTION DECIMAL ANGLES
MATERIAL
FINISH

DRAWN BY SOFO 6/2/61
CHECKED
APPROVED

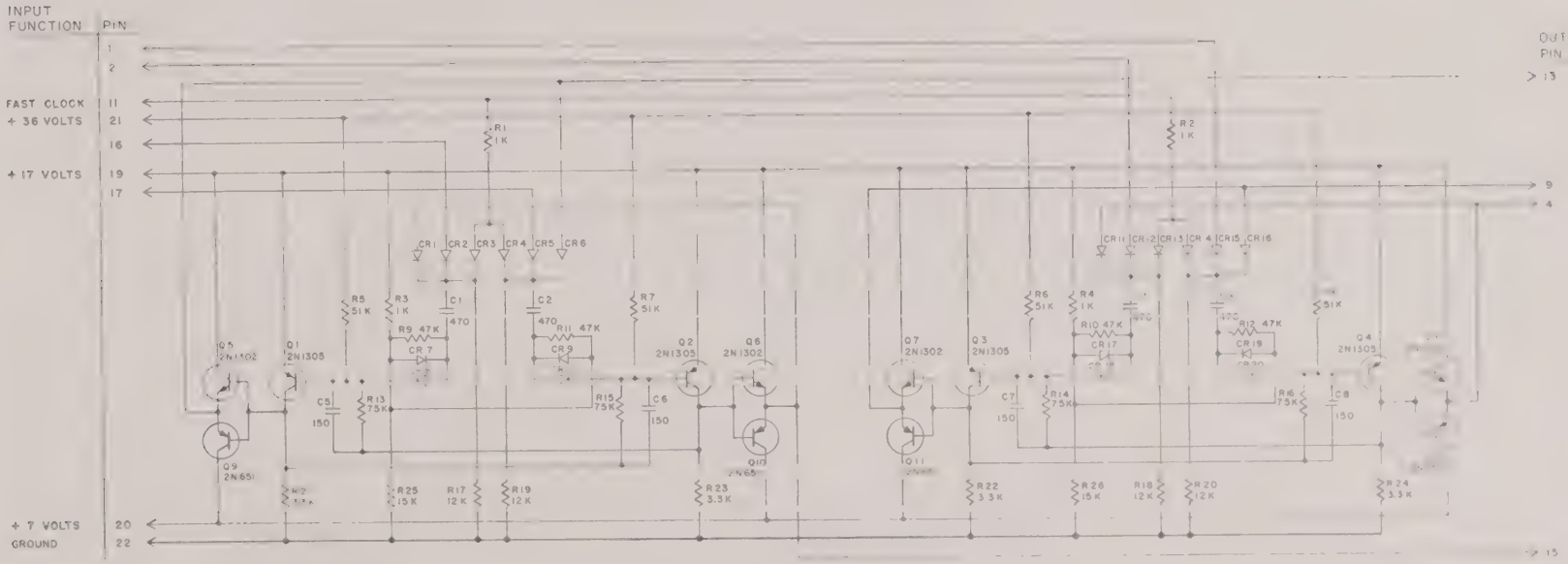
TITLE
SCHEMATIC-
COUNTER MATRIX
MODEL V44

NON-LINEAR SYSTEMS INC
DEL MAR AIRPORT
DEL MAR, CALIFORNIA

28000-068
SHEET 2



CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
R25 & R26	Com'l	RESISTOR, 15K, 1/2W, 5% (Composition)	2	Allen Bradley
R21 thru R24	Com'l	RESISTOR, 3.3K, 1/2W, 5% (Composition)	4	Allen Bradley
R17 thru R20	Com'l	RESISTOR, 12K, 1/2W, 5% (Composition)	4	Allen Bradley
R13 thru R16	Com'l	RESISTOR, 7.5K, 1/2W, 5% (Composition)	4	Allen Bradley
R9 thru R12	Com'l	RESISTOR, 47K, 1/2W, 5% (Composition)	4	Allen Bradley
R5 thru R8	Com'l	RESISTOR, 51K, 1/2W, 5% (Composition)	4	Allen Bradley
R1 thru R4	Com'l	RESISTOR, 1K, 1/2W, 5% (Composition)	4	Allen Bradley
C5 thru C8	JL 150	CAPACITOR, 150$\mu\mu$, 10%, 1000 VDC	4	Radio Mat'ls Co.
C1 thru C4	JL 470	CAPACITOR, 470$\mu\mu$, 10%, 1000 VDC	4	Radio Mat'ls Co.
CR1 thru CR20	1N625	DIODE	20	Hughes
Q9 thru Q12	2N651	TRANSISTOR, PNP	4	Motorola
Q5 thru Q8	2N1302	TRANSISTOR, NPN	4	Texas Instrument
Q1 thru Q4	2N1305	TRANSISTOR, PNP	4	Texas Instrument



28000 064
SHEET 4

NOTES UNLESS OTHERWISE SPECIFIED

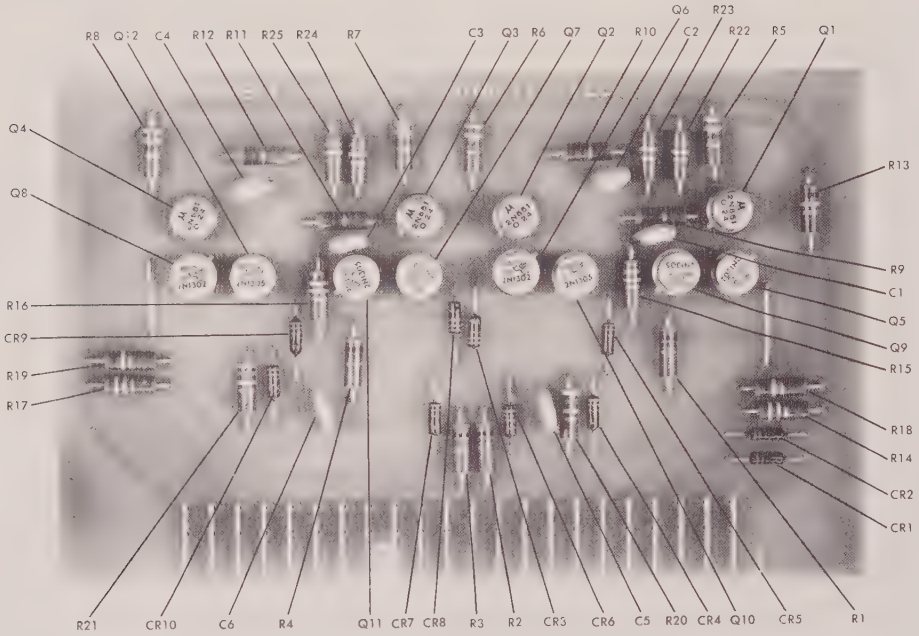
1. ALL RESISTORS ARE CARBON, 1/2 W, 5%
2. ALL DIODES ARE IN625
3. ALL CAPACITOR VALUES ARE IN MMFDS

SCHEMATIC
COUNTER FLIP-FLOP & CHOPPER DRIVE
MODEL 444

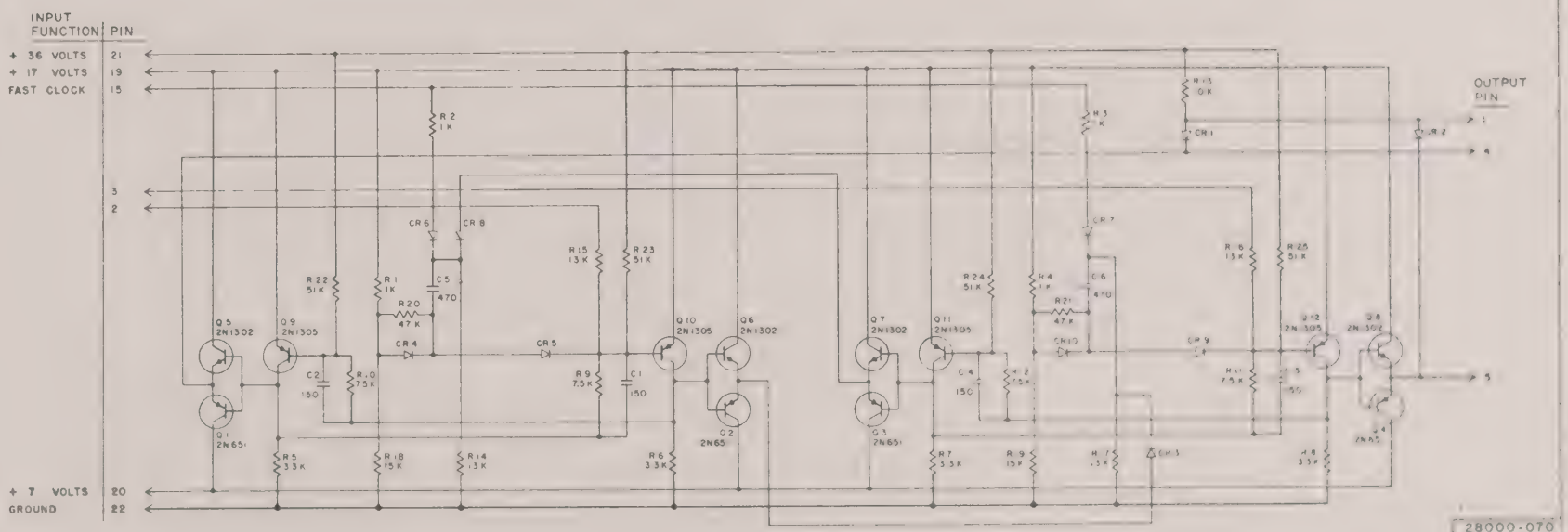
NLS NON LINEAR SYSTEMS INC

28000 063

28000-070 SYNC FLIP-FLOP ASSEMBLY



CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
C5, C6	JL-470	CAPACITOR, 470 mmfd, 10%, 1000 VDC	2	RMC
C1 thru C4	JL-150	CAPACITOR, 150 mmfd, 10%, 1000 VDC	4	RMC
Q9 thru Q12	2N1305	TRANSISTOR	4	Texas Instruments
Q5 thru Q8	2N1302	TRANSISTOR	4	Texas Instruments
Q1 thru Q4	2N651	TRANSISTOR	4	Motorola
CR1 thru CR10	1N625	DIODE, SILICON	10	Hughes
R22 thru R25		RESISTOR, 51K, 5%, 1/2W (Composition)	4	Allen Bradley
R20, R21		RESISTOR, 47K, 5%, 1/2W (Composition)	2	Allen Bradley
R18, R19		RESISTOR, 15K, 5%, 1/2W (Composition)	2	Allen Bradley
R14 thru R17		RESISTOR, 13K, 5%, 1/2W (Composition)	4	Allen Bradley
R13		RESISTOR, 10K, 5%, 1/2W (Composition)	1	Allen Bradley
R9 thru R12		RESISTOR, 7.5K, 5%, 1/2W (Composition)	4	Allen Bradley
R5 thru R8		RESISTOR, 3.3K, 5%, 1/2W (Composition)	4	Allen Bradley
R1 thru R4		RESISTOR, 1K, 5%, 1/2W (Composition)	4	Allen Bradley



28000-070
SHEET 2

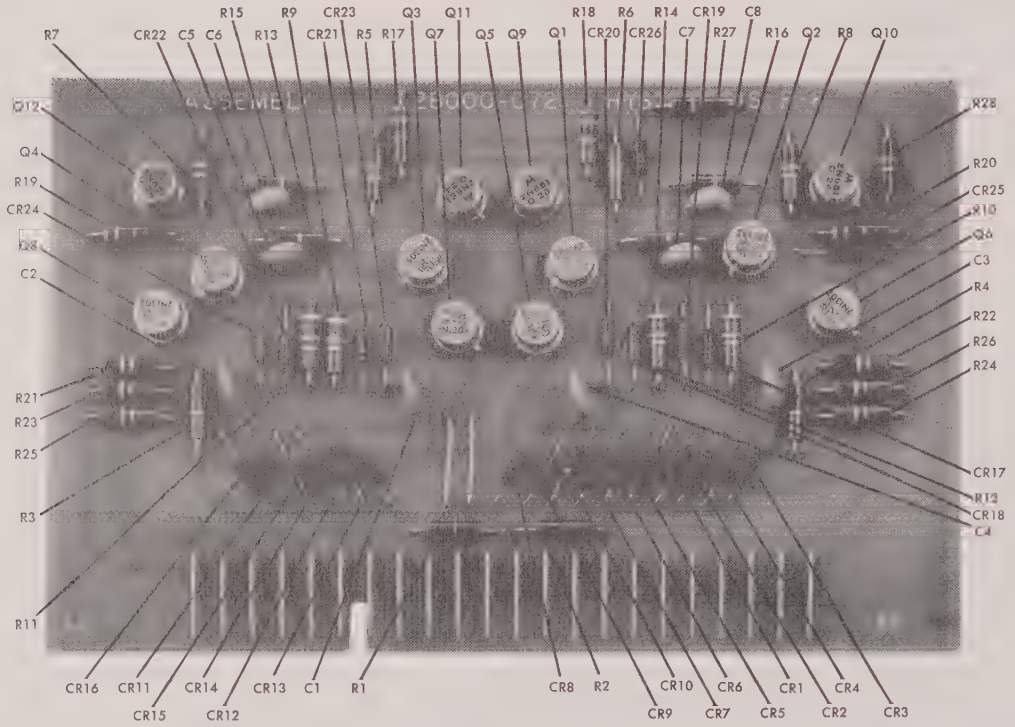
NOTES UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE CARBON, 1/2 W, 5%
2. ALL DIODES ARE IN625
3. ALL CAPACITOR VALUES ARE IN MMFDS

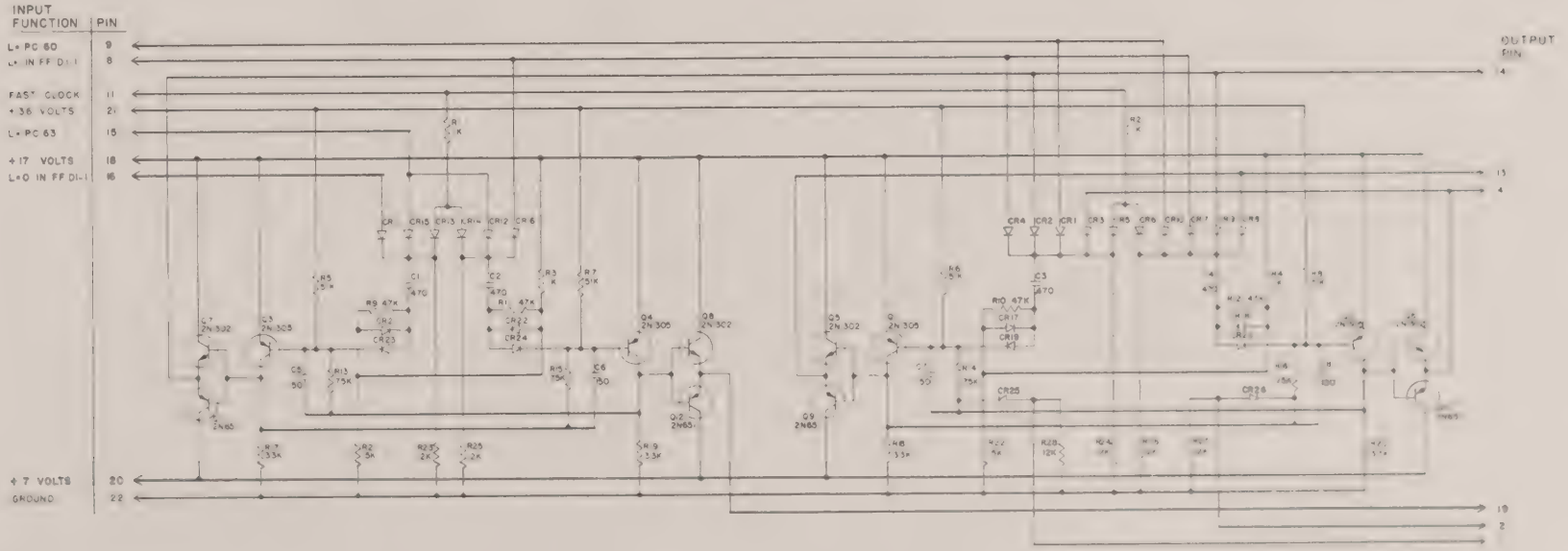
SCHEMATIC -
SYNC FLIP-FLOP

NLS NON LINEAR SYSTEMS INC

28000-072 HYSTERESIS FLIP-FLOP ASSEMBLY



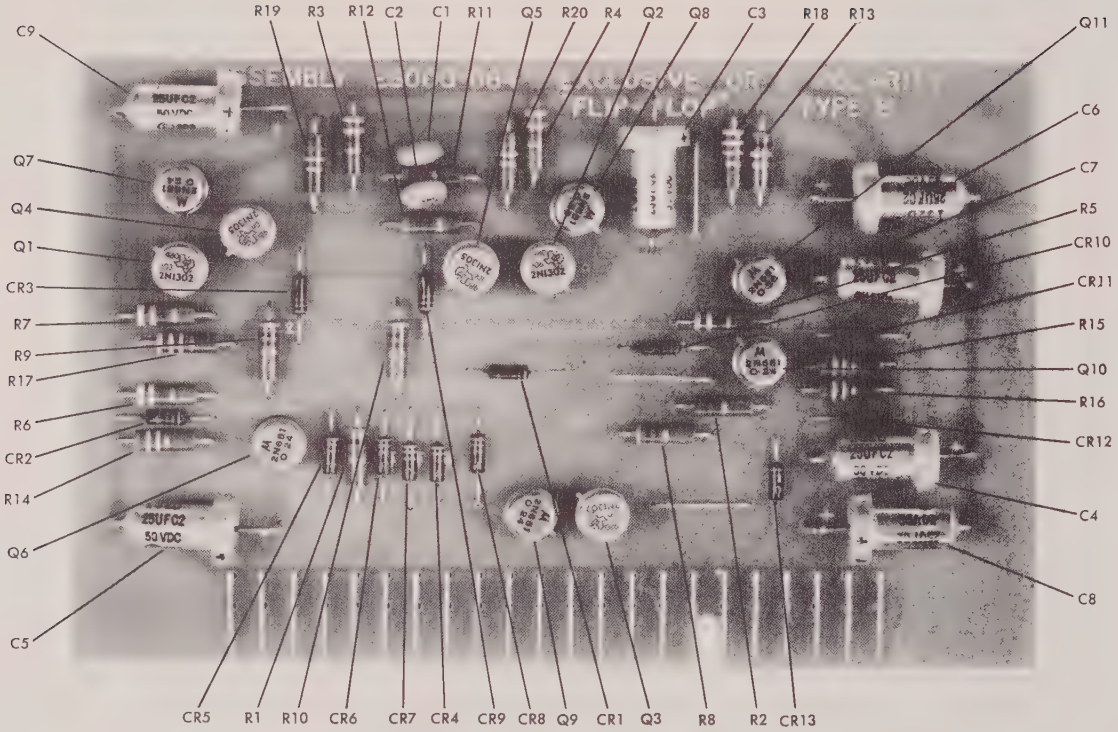
CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
C5 thru C8	JL 150	CAPACITOR, 150 mmfd, 10%, 1000 VDC	4	Radio Mat'ls. Co.
C1 thru C4	JL 470	CAPACITOR, 470 mmfd, 10%, 1000 VDC	4	Radio Mat'ls. Co.
R23 thru R28	Com'l	RESISTOR, 12K, 1/2W, 5% (Composition)	6	Allen Bradley
R1 and R22	Com'l	RESISTOR, 15K, 1/2W, 5% (Composition)	2	Allen Bradley
R17 thru R20	Com'l	RESISTOR, 3.3K, 1/2W, 5% (Composition)	4	Allen Bradley
R13 thru R16	Com'l	RESISTOR, 7.5K, 1/2W, 5% (Composition)	4	Allen Bradley
R9 thru R12	Com'l	RESISTOR, 47K, 1/2W, 5% (Composition)	4	Allen Bradley
R5 thru R8	Com'l	RESISTOR, 51K, 1/2W, 5% (Composition)	4	Allen Bradley
R1 thru R4	Com'l	RESISTOR, 1K, 1/2W, 5% (Composition)	4	Allen Bradley
CR1 thru CR26	IN625	DIODE	26	Hughes
Q9 thru Q12	2N 651	TRANSISTOR, PNP	4	Motorola
Q5 thru Q8	2N 1302	TRANSISTOR, NPN	4	Texas Instrument
Q1 thru Q4	2N 1305	TRANSISTOR, PNP	4	Texas Instrument



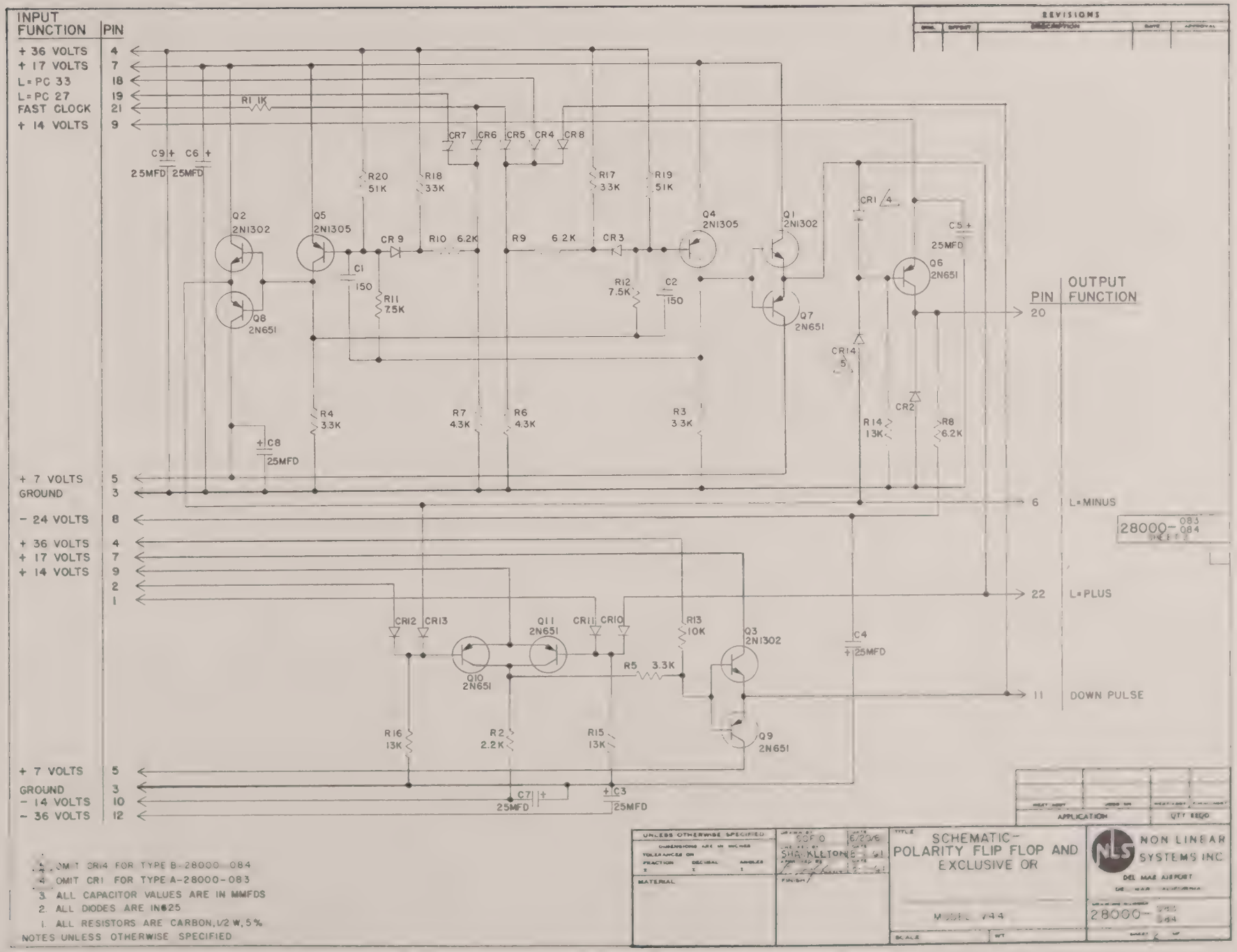
28000-072

NOTES UNLESS OTHERWISE SPECIFIED
1. ALL RESISTORS ARE CARBON, 1/4 W, 5%
2. ALL DIODES ARE IN625
3. ALL CAPACITOR VALUES ARE IN MMFDS

28000-084 POLARITY FLIP-FLOP ASSEMBLY

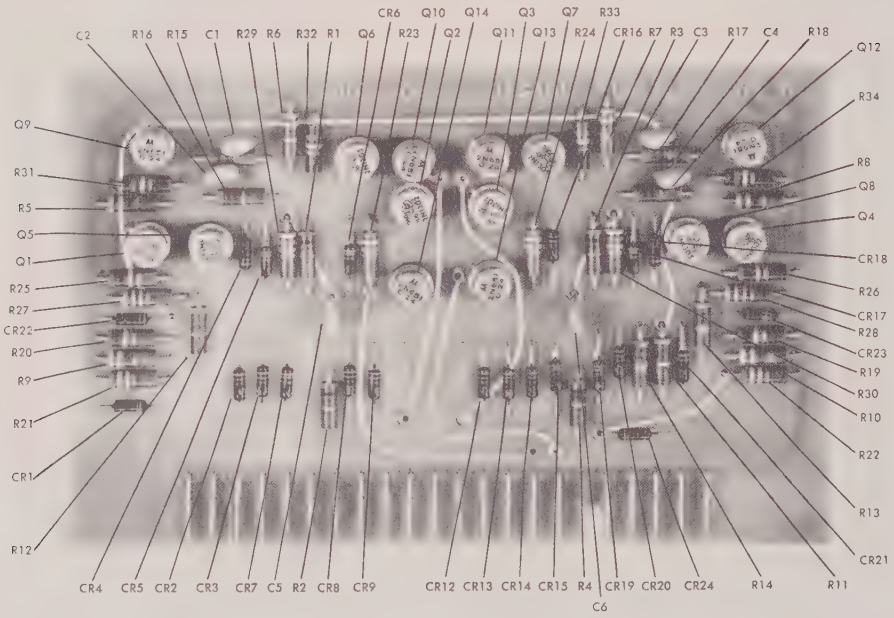


CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
Q6 thru Q11	2N651	TRANSISTOR, PNP	6	Motorola
Q4 thru Q5	2N1305	TRANSISTOR, PNP	2	Texas Instruments
Q1, Q2 & Q3	2N1302	TRANSISTOR, NPN	3	Texas Instruments
C3 thru C9	PP25B50A2	CAPACITOR, 25μf 50 VDC Tantalum	7	Fansteel
C1 & C2	JL150	CAPACITOR, 150$\mu\mu$f, 10%, 1000 VDC	2	Radio Mat'ls Co.
CR2 thru CR14	1N625	DIODE, Silicon (-083 only)	13	Hughes
CR1 thru CR13	1N625	DIODE, Silicon (-084 only)		
R19 & R20	Com'l	RESISTOR, 51K, 5%, 1/2W (Composition)	2	Allen Bradley
R17 & R18	Com'l	RESISTOR, 33K, 5%, 1/2W (Composition)	2	Allen Bradley
R14, R15 & R16	Com'l	RESISTOR, 13K, 5%, 1/2W (Composition)	3	Allen Bradley
R13	Com'l	RESISTOR, 10K, 5%, 1/2W (Composition)	1	Allen Bradley
R11 & R12	Com'l	RESISTOR, 7.5K, 5%, 1/2W (Composition)	2	Allen Bradley
R8, R9 & R10	Com'l	RESISTOR, 6.2K, 5%, 1/2W (Composition)	3	Allen Bradley
R6 & R7	Com'l	RESISTOR, 4.3K, 5%, 1/2W (Composition)	2	Allen Bradley
R3, R4 & R5	Com'l	RESISTOR, 3.3K, 5% 1/2W (Composition)	3	Allen Bradley
R2	Com'l	RESISTOR, 2.2K, 5%, 1/2W (Composition)	1	Allen Bradley
R1	Com'l	RESISTOR, 1K, 5%, 1/2W (Composition)	1	Allen Bradley

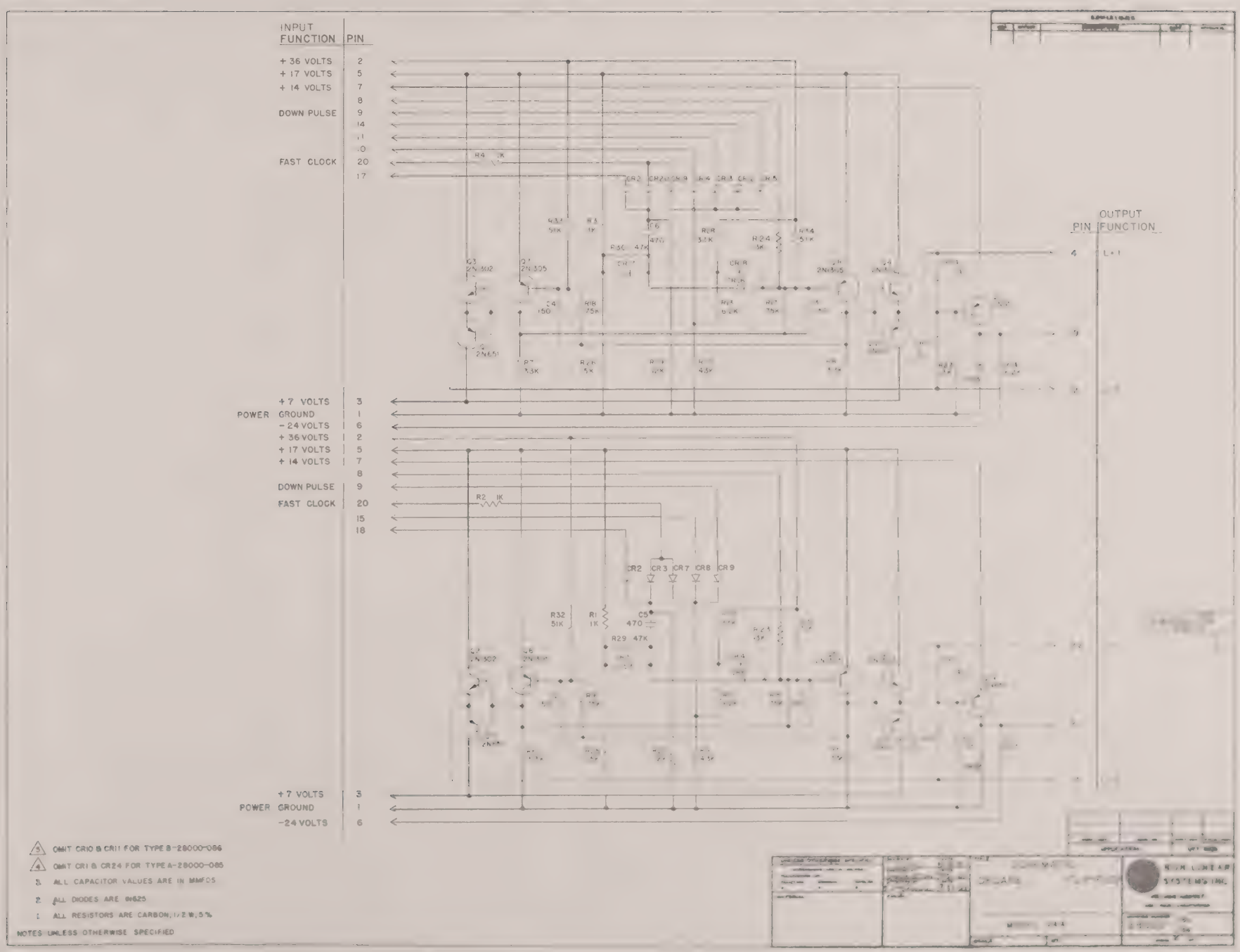

INPUT FUNCTION
PIN
+ 36 VOLTS 4
+ 17 VOLTS 7
L=PC 33 18
L=PC 27 19
FAST CLOCK 21
+ 14 VOLTS 9
+ 7 VOLTS 5
GROUND 3
- 24 VOLTS 8
+ 36 VOLTS 4
+ 17 VOLTS 7
+ 14 VOLTS 9
2
1
+ 7 VOLTS 5
GROUND 3
- 14 VOLTS 10
- 36 VOLTS 12
R1 1K
C9 + 25MFD
C6 + 25MFD
R20 51K
R18 33K
CR7 CR6 CR5 CR4 CR8
R17 3.3K
R19 51K
Q2 2N1302
Q5 2N1305
CR9
R10 6.2K
R9 6.2K
CR3
Q4 2N1305
Q1 2N1302
CR1 4
C5 + 25MFD
Q6 2N651
C1 150
R11 7.5K
R12 7.5K
C2 150
Q8 2N651
Q7 2N651
CR14 5
CR2
R4 3.3K
R7 4.3K
R6 4.3K
R3 3.3K
R14 13K
R8 6.2K
+C8 25MFD
CR12 CR13
Q11 2N651
CR11 CR10
R13 10K
Q3 2N1302
C4 + 25MFD
Q10 2N651
R5 3.3K
R16 13K
R2 2.2K
R15 13K
Q9 2N651
C7 + 25MFD
+C3 25MFD
PIN OUTPUT FUNCTION
20
6 L=MINUS
22 L=PLUS
11 DOWN PULSE
28000-083
28000-084
REVISIONS
APPLICATION
QTY REQD
NOTES UNLESS OTHERWISE SPECIFIED
1. ALL RESISTORS ARE CARBON, 1/2 W, 5%
2. ALL DIODES ARE IN625
3. ALL CAPACITOR VALUES ARE IN MMFDS
4. OMIT CR1 FOR TYPE A-28000-083
5. OMIT CR14 FOR TYPE B-28000-084
UNLESS OTHERWISE SPECIFIED
MATERIAL
FINISH
SHA-KLETONE
TITLE
SCHEMATIC-
POLARITY FLIP FLOP AND
EXCLUSIVE OR
NLS NON LINEAR SYSTEMS INC
DEL MAR AIRPORT
28000-

28000-086

DECADE FLIP-FLOP ASSEMBLY

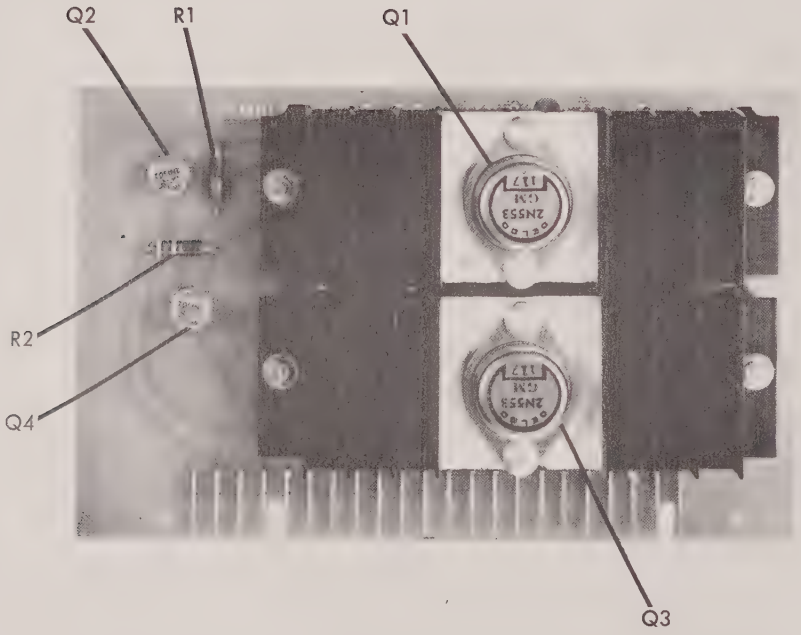


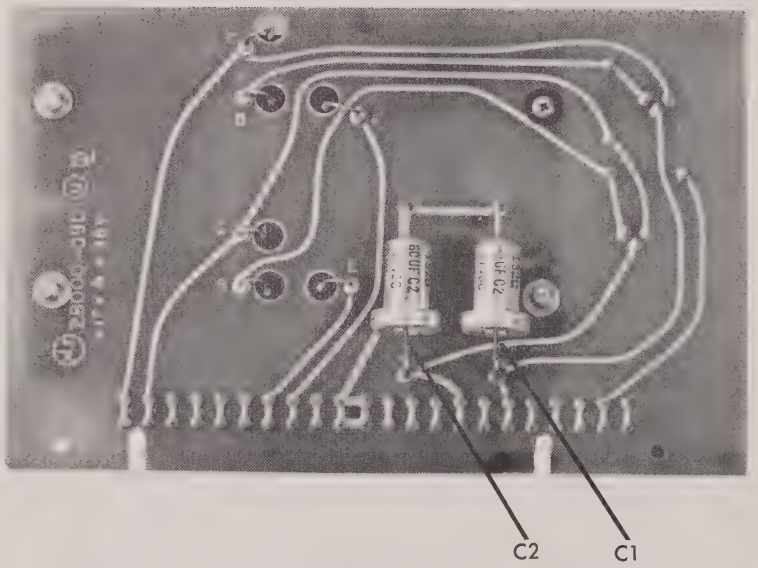
CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
Q9 thru Q14	2N651	TRANSISTOR	6	Texas Instruments
Q5 thru Q8	2N1305	TRANSISTOR	4	Texas Instruments
Q1 thru Q4	2N1302	TRANSISTOR	4	Texas Instruments
CR1-9 & CR12-24	1N625	DIODE, SILICON (-086 only)	22	Hughes
CR2 thru CR23	1N625	DIODE, SILICON (-085 only)		
C5, C6	JL-470	CAPACITOR, 470$\mu\mu$f, 10%, 1000 VDC	2	Radio Mat'ls Co.
C1 thru C4	JL-150	CAPACITOR, 150$\mu\mu$f, 10%, 1000 VDC	4	Radio Mat'ls Co.
R31 thru R34		RESISTOR, 51K, 5%, 1/2W (Composition)	4	Allen Bradley
R29 & R30		RESISTOR, 47K, 5%, 1/2W (Composition)	2	Allen Bradley
R27, R28		RESISTOR, 33K, 5%, 1/2W (Composition)	2	Allen Bradley
R25, R26		RESISTOR, 15K, 5%, 1/2W (Composition)	2	Allen Bradley
R21 thru R24		RESISTOR, 13K, 5%, 1/2W (Composition)	4	Allen Bradley
R19 thru R20		RESISTOR, 12K, 5%, 1/2W (Composition)	2	Allen Bradley
R15 thru R18		RESISTOR, 7.5K, 5%, 1/2W (Composition)	4	Allen Bradley
R11 thru R14		RESISTOR, 6.2K, 5%, 1/2W (Composition)	4	Allen Bradley
R9, R10		RESISTOR, 4.3K, 5%, 1/2W (Composition)	2	Allen Bradley
R5 thru R8		RESISTOR, 3.3K, 5%, 1/2W (Composition)	4	Allen Bradley
R1 thru R4		RESISTOR, 1K, 5%, 1/2W (Composition)	4	Allen Bradley



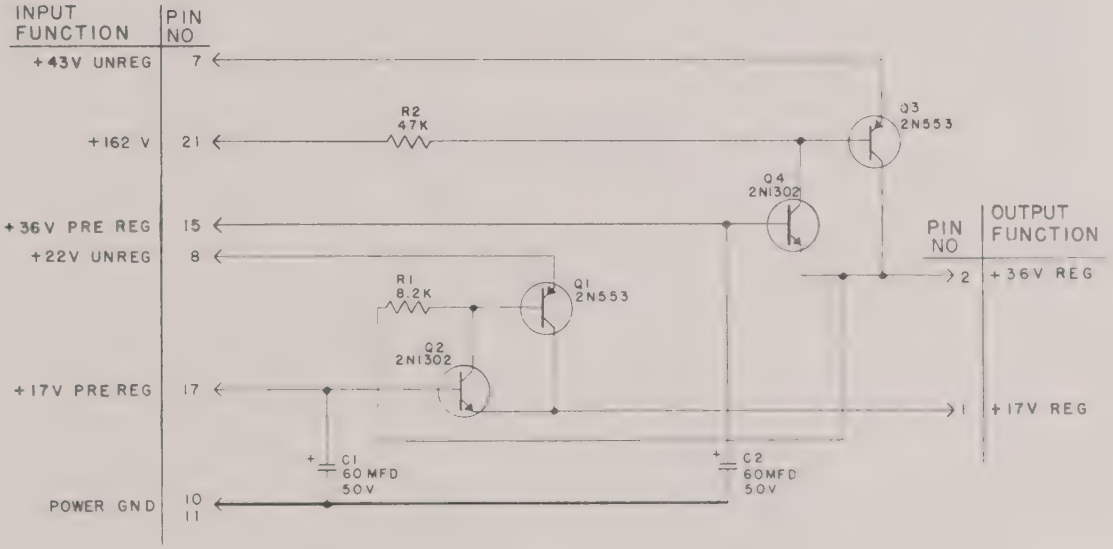
NOTES UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE CARBON, 1/2 W, 5%
2. ALL DIODES ARE 1N625
3. ALL CAPACITOR VALUES ARE IN MMFDS
4. OMIT CR10 & CR11 FOR TYPE B-28000-086
5. OMIT CR1 & CR24 FOR TYPE A-28000-085





CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
C1 & C2	PP60B50A2	CAPACITOR, Tantalum, 60μf, 50 WVDC	2	Fansteel
R2	Com'l	RESISTOR, 47K, 1/2W, 5% (Composition)	1	Allen Bradley
R1	Com'l	RESISTOR, 8.2K, 1/2W, 5% (Composition)	1	Allen Bradley
Q2 & Q4	2N1302	TRANSISTOR, NPN	2	Texas Instruments
Q1 & Q3	2N553	TRANSISTOR, PNP	2	Delco



28000-091
SHEET 2

NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE CARBON, 1/2W, 5%

		APPLICATION	QTY PROD

UNLESS OTHERWISE SPEC.
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTIONS DECIMAL ANGLES
± ± ±
MATERIAL
FINISH

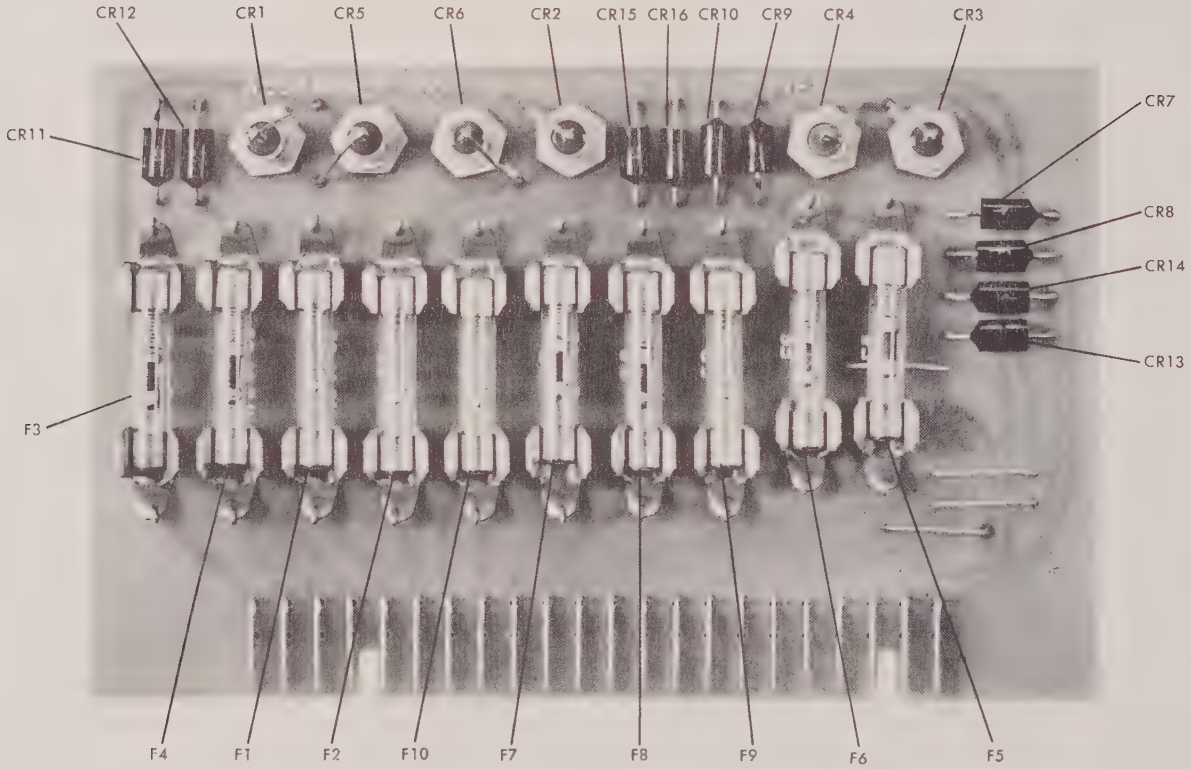
DRAWN BY A.R. BALLIN DATE 27 FEB 61
CHECKED BY SHACKLETON DATE 7-19-61
APPROVED BY DATE 7-19-61

TITLE
SCHEMATIC
+17V & +36V
REGULATORS
MODEL V44

SCALE QTY

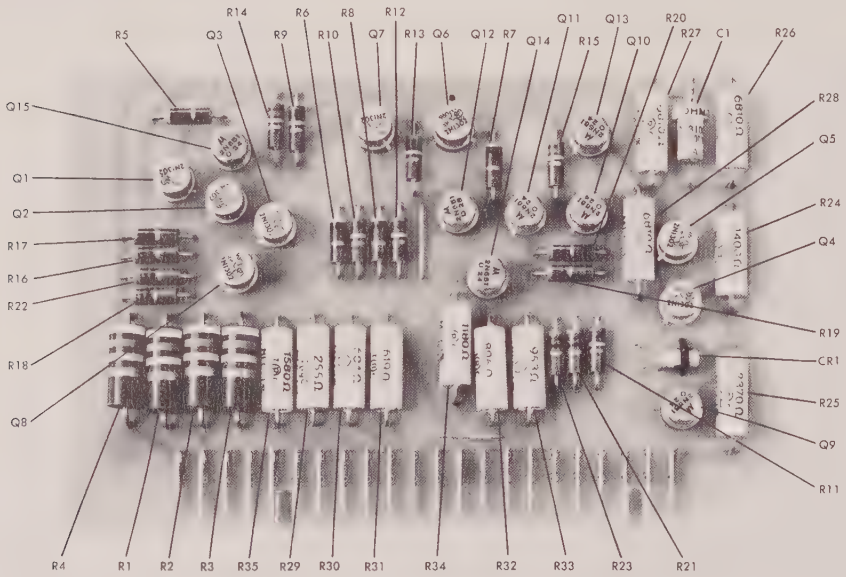
NON-LINEAR SYSTEMS INC
DEL MAR AIRPORT
DEL MAR, CALIFORNIA

DRAWING NUMBER
28000-091
SHEET 2 OF

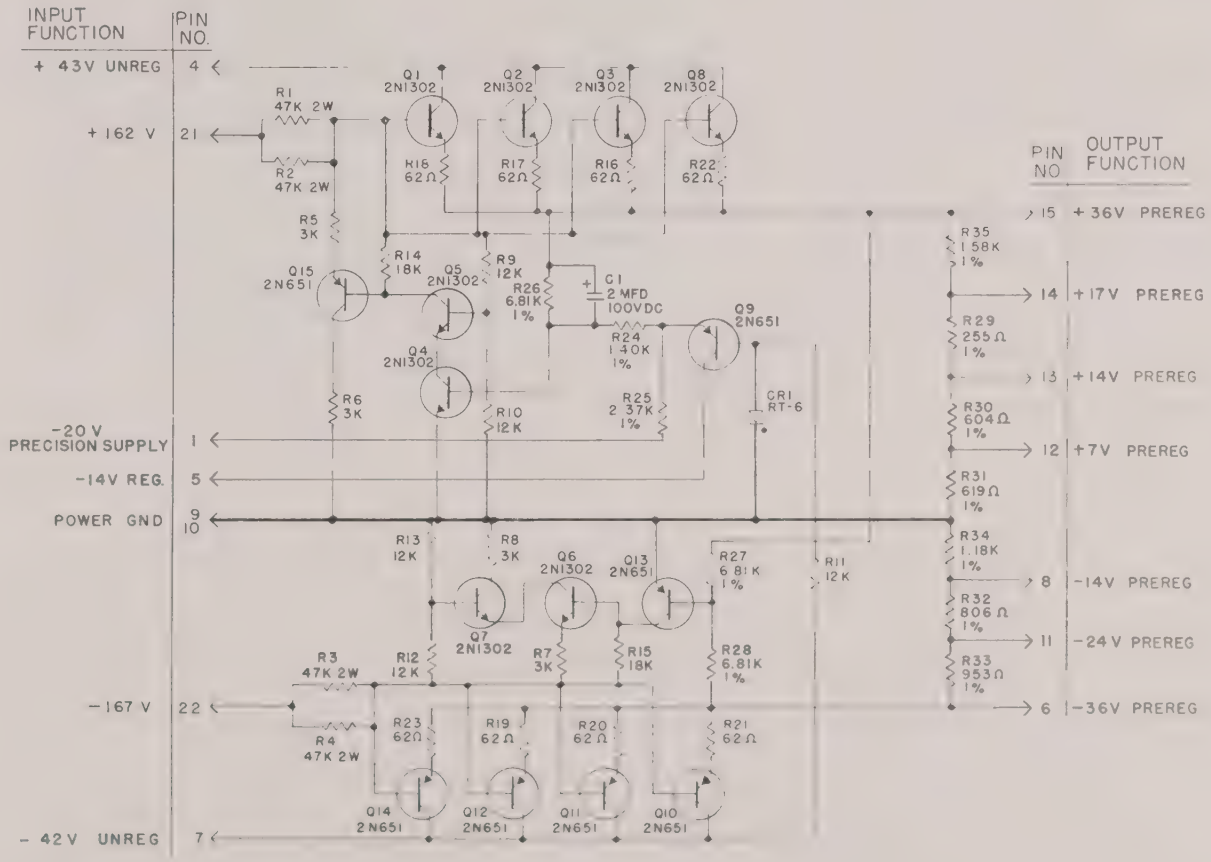


CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
F9 and F10	313.001	FUSE, Type 3AG, Slo-Blo, 1 Amp.	2	Littelfuse
F7 and F8	313.125	FUSE, Type 3AG, Slo-Blo, 1/8 Amp.	2	Littelfuse
F3 thru F6	313.500	FUSE, Type 3AG, Slo-Blo, 1/2 Amp.	4	Littelfuse
F1 and F2	31301.5	FUSE, Type 3AG, Slo-Blo, 1.5 Amp.	2	Littelfuse
CR7 thru CR16	1N2071	RECTIFIER	10	Texas Instruments
CR1 thru CR6	1N1124R	RECTIFIER	6	Texas Instruments

See Schematics 28000-119
and
28000-133



CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
C1	PP2B100C1	CAPACITOR, 2μf, 100 WVDC Tantalum	1	Fansteel
R33	MEC-T2	RESISTOR, 953 Ohms, 1/2W, 1%	1	I.R.C.
R32	MEC-T2	RESISTOR, 806 Ohms, 1/2W, 1%	1	I.R.C.
R31	MEC-T2	RESISTOR, 619 Ohms, 1/2W, 1%	1	I.R.C.
R30	MEC-T2	RESISTOR, 604 Ohms, 1/2W, 1%	1	I.R.C.
R29	MEC-T2	RESISTOR, 255 Ohms, 1/2W, 1%	1	I.R.C.
R26 thru R28	MEC-T2	RESISTOR, 6.81K, 1/2W, 1%	3	I.R.C.
R25	MEC-T2	RESISTOR, 2.37K, 1/2W, 1%	1	I.R.C.
R24	MEC-T2	RESISTOR, 1.40K, 1/2W, 1%	1	I.R.C.
R35	MEC-T2	RESISTOR, 1.58K, 1/2W, 1%	1	I.R.C.
R34	MEC-T2	RESISTOR, 1.18K, 1/2W, 1%	1	I.R.C.
R16 thru R23	Com'l	RESISTOR, 62Ω, 1/2W, 5% (Composition)	8	Allen Bradley
R14, R15	Com'l	RESISTOR, 18K, 1/2W, 5% (Composition)	2	Allen Bradley
R9 thru R13	Com'l	RESISTOR, 12K, 1/2W, 5% (Composition)	5	Allen Bradley
R5 thru R8	Com'l	RESISTOR, 3K, 1/2W, 5% (Composition)	4	Allen Bradley
R1 thru R4	Com'l	RESISTOR, 47K, 2W, 5% (Composition)	4	Allen Bradley
CR1	RT6	ZENER DIODE	1	Hoffman
Q9 thru Q15	2N651	TRANSISTOR, PNP	7	Motorola
Q1 thru Q8	2N1302	TRANSISTOR, NPN	8	Texas Instrument



28000-095
SHEET 2

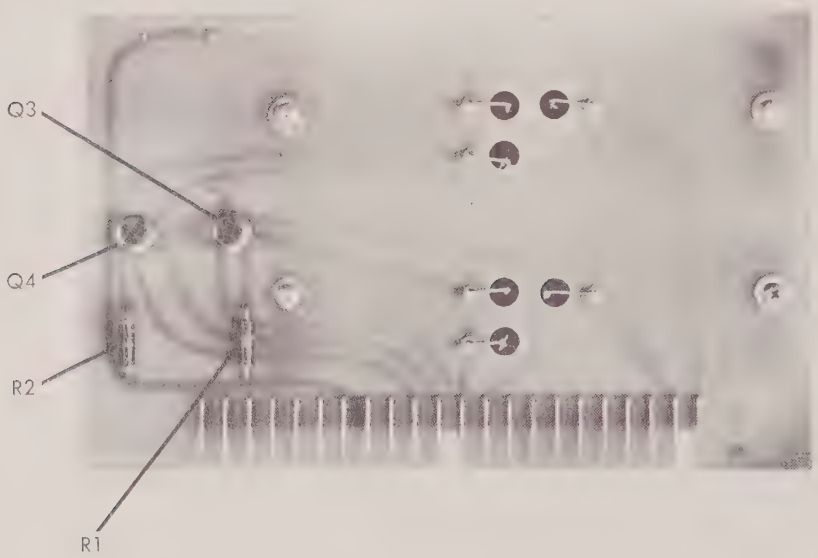
2 ALL 1% RESISTORS ARE METAL FILM, TYPE MEC-T2 (IRC)

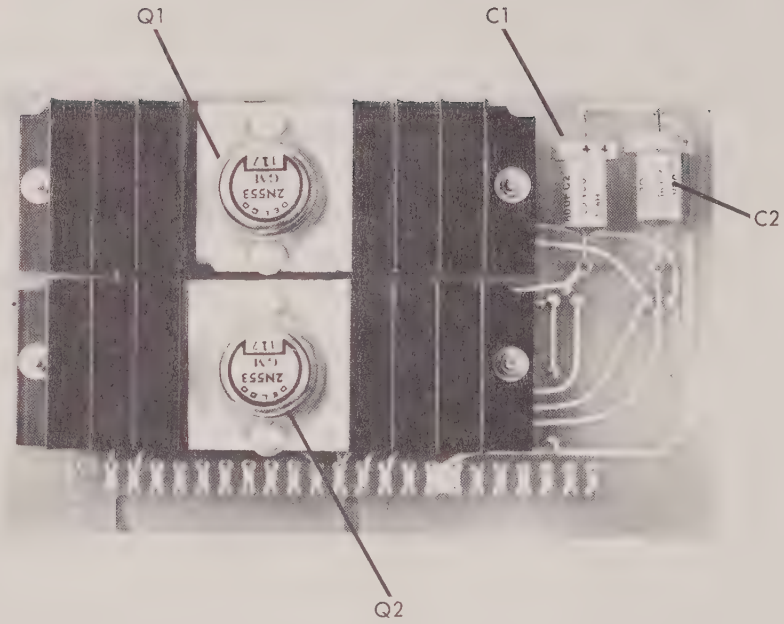
1. ALL RESISTORS ARE CARBON, 1/2W, 5%

NOTES: UNLESS OTHERWISE SPECIFIED-

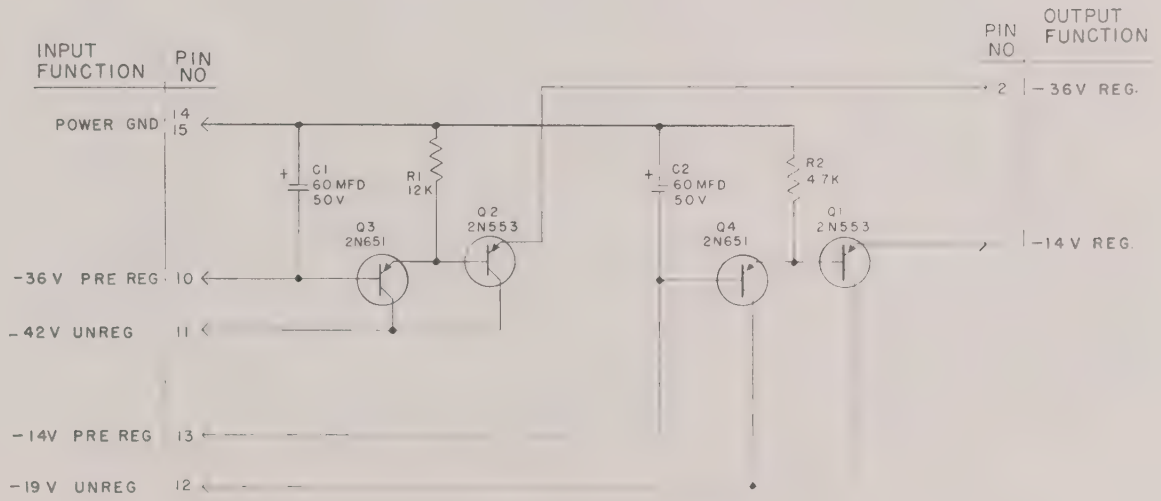
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTION DECIMAL ANGLES MATERIAL	DRAWN BY A R MALLIN DATE 17 FEB 61 APPR. BY SHACKLETON DATE 4 21 61 APPR. BY DATE 5 4 61	TITLE SCHEMATIC PREREGULATED VOLTAGES POWER SUPPLY MODEL V44 SCALE WT	NON LINEAR SYSTEMS INC DEL MAR CALIFORNIA 28000-095 SHEET 2

NEXT ASSY	USED ON	NEXT ASSY	MFG APPL
APPLICATION		QTY REQD	





CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
C1 & C2	PP60B50A2	CAPACITOR, Tantalum, 60μf, 50 WVDC	2	Fansteel
R2	Com'l	RESISTOR, 4.7K, 1/2W, 5% (Composition)	1	Allen Bradley
R1	Com'l	RESISTOR, 12K, 1/2W, 5% (Composition)	1	Allen Bradley
Q3 & Q4	2N651	TRANSISTOR, PNP	2	Motorola
Q1 & Q2	2N553	TRANSISTOR, PNP	2	Delco



SHEET 2

NOTES UNLESS OTHERWISE SPECIFIED

1 ALL RESISTORS ARE CARBON, 1/2W, 5%

UNLESS OTHERWISE SPECIFIED

MATERIAL

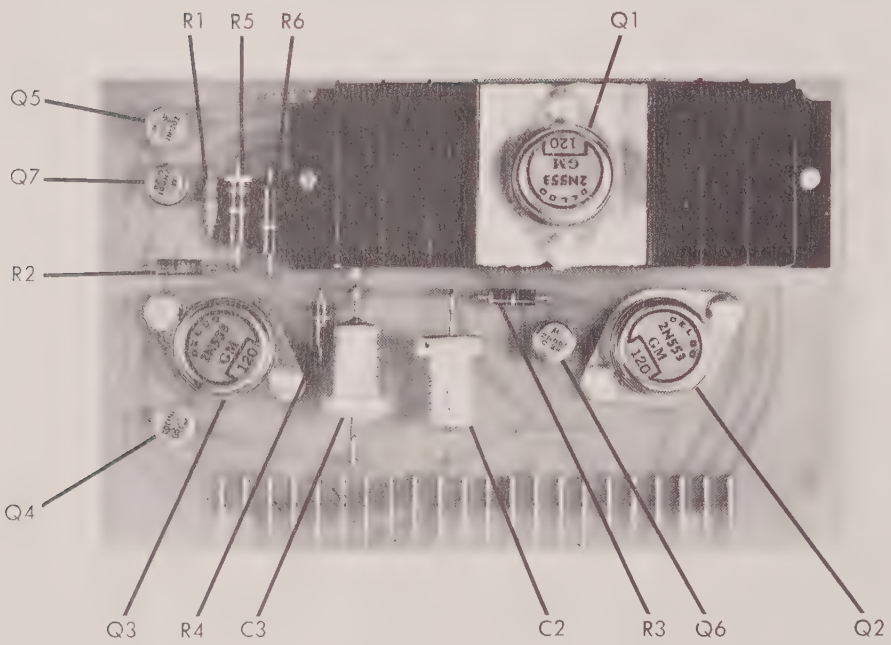
APPLICATION

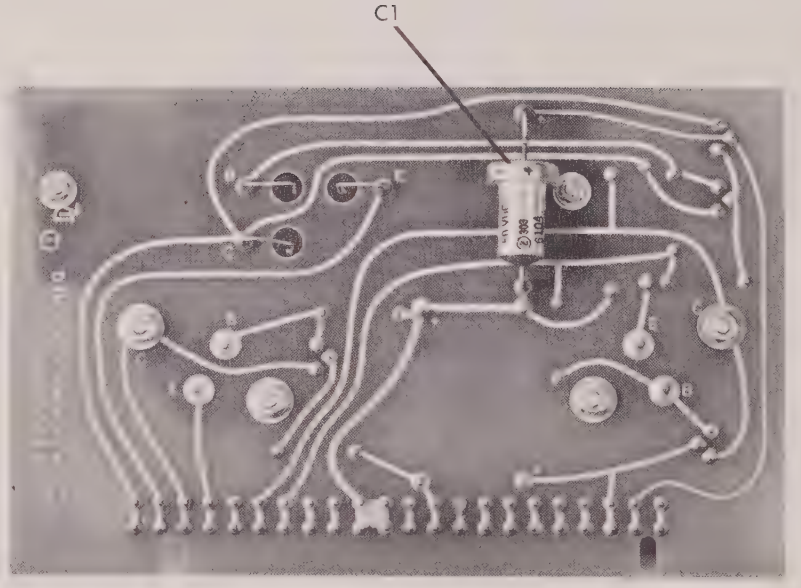
SCHEMATIC
-14V & -36V
REGULATORS
MODEL V44

NON-LINEAR SYSTEMS INC
DEL MAR AIRPORT

28000-096

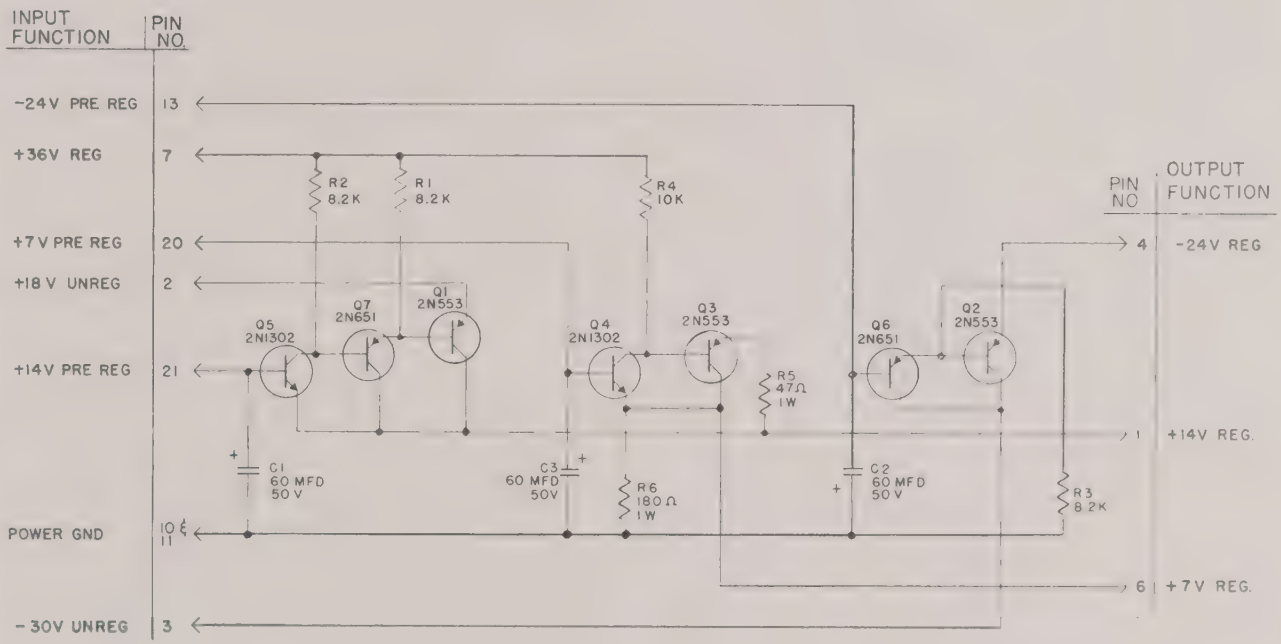
SHEET 2





CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
C1 thru C3	PP60B50A2	CAPACITOR, Tantalum, 60μf, 50 WVDC	3	Fansteel
R6	Com'l	RESISTOR, 180 Ohms, 1W, 5%	1	Allen Bradley
R5	Com'l	RESISTOR, 47 Ohms, 1W, 5%	1	Allen Bradley
R4	Com'l	RESISTOR, 10K, 1/2W, 5%	1	Allen Bradley
R1 thru R3	Com'l	RESISTOR, 8.2K, 1/2W, 5%	3	Allen Bradley
Q6 and Q7	2N651	TRANSISTOR, PNP	2	Motorola
Q4 and Q5	2N1302	TRANSISTOR, NPN	2	Texas Instrument
Q1 and Q3	2N553	TRANSISTOR, POWER, PNP	3	Delco

REVISIONS



28000-097
SHEET 2

1. ALL RESISTORS ARE CARBON, 1/2W, 5%

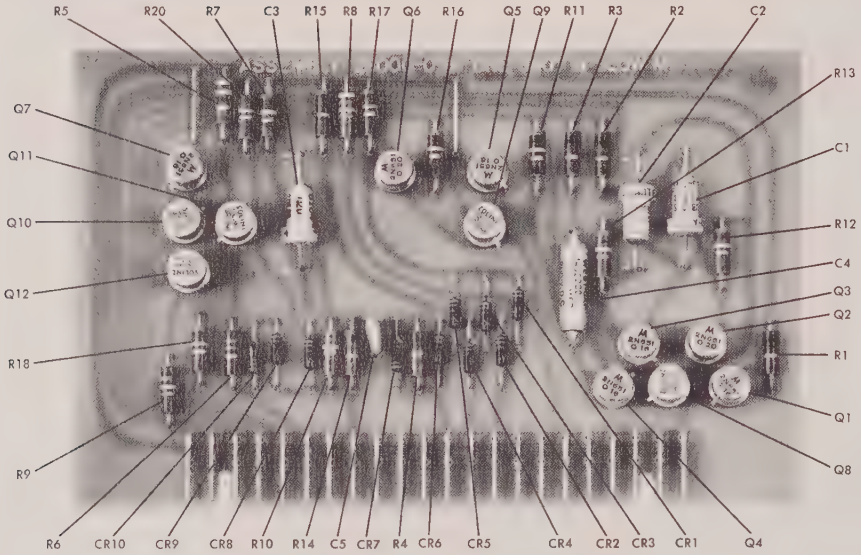
NOTES: UNLESS OTHERWISE SPECIFIED

APPLICATION | QTY REQD

SCHEMATIC
+7V, +14V & -24V REG.
MODEL V44

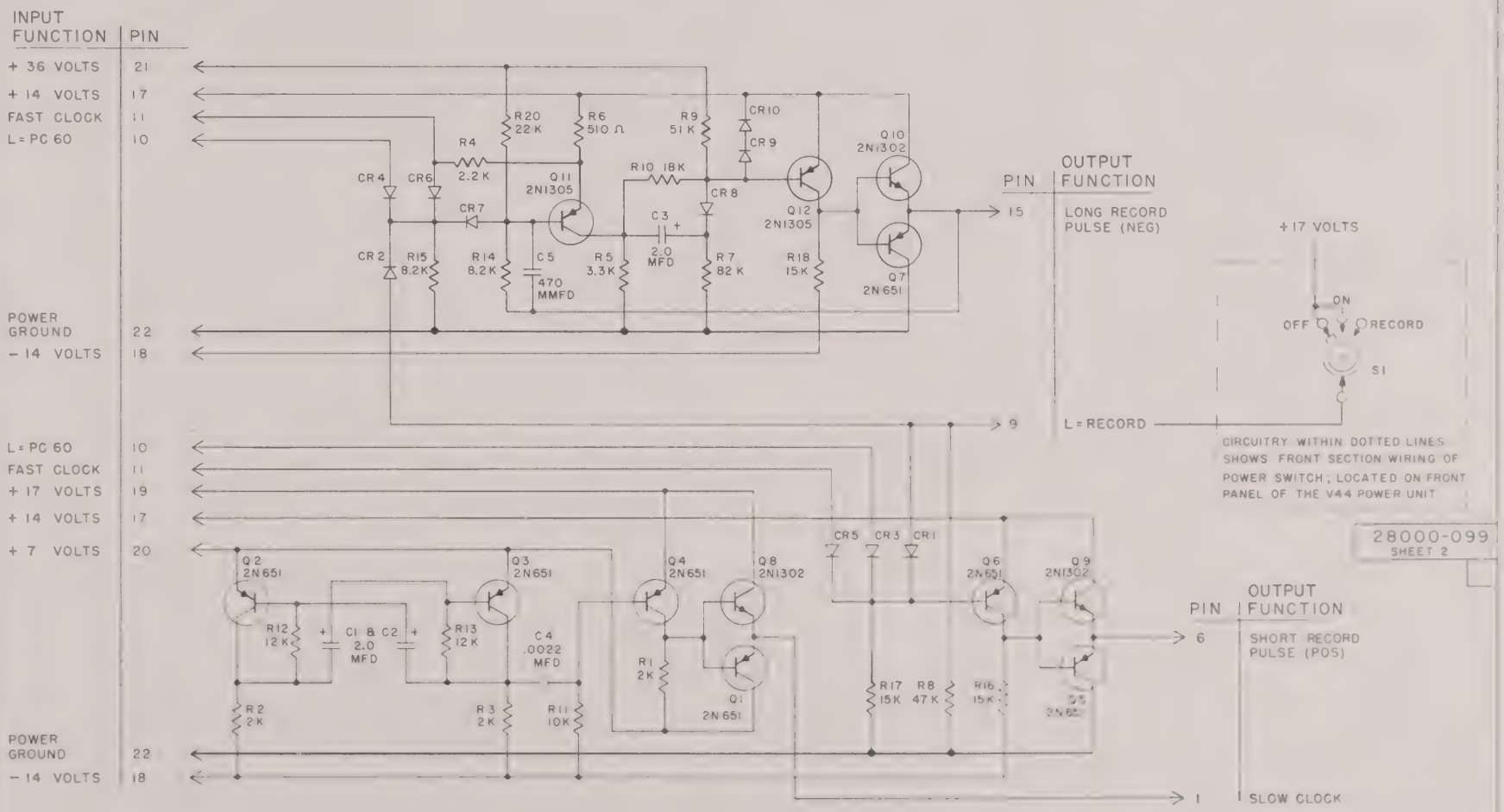
NON-LINEAR SYSTEMS INC
DEL MAR AIRPORT
DEL MAR, CALIFORNIA

28000-097



CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
Q11, Q12	2N1305	TRANSISTOR	2	Texas Instruments
Q8 thru Q10	2N1302	TRANSISTOR	3	Texas Instruments
Q1 thru Q7	2N651	TRANSISTOR	7	Motorola
CR1 thru CR10	1N625	DIODE, SILICON	10	Hughes
C5	J1470	CAPACITOR, 470 mfd, 200V, 10%	1	RMC
C4	14J2222	CAPACITOR, .0022 mfd ±5%, 200 VDC	1	West-Cap
C1 thru C3	PP2B100C1	CAPACITOR, 2 mfd, Tantalum, 100 VDC	3	Fansteel
R20	Com'l	RESISTOR, 22K, 5%, 1/2W (Composition)	1	Allen Bradley
R16-R18	Com'l	RESISTOR, 15K, 5%, 1/2W (Composition)	3	Allen Bradley
R14, R15	Com'l	RESISTOR, 8.2K, 5%, 1/2W (Composition)	2	Allen Bradley
R12, R13	Com'l	RESISTOR, 12K, 5%, 1/2W (Composition)	2	Allen Bradley
R11	Com'l	RESISTOR, 10K, 5%, 1/2W (Composition)	1	Allen Bradley
R10	Com'l	RESISTOR, 18K, 5%, 1/2W (Composition)	1	Allen Bradley
R9	Com'l	RESISTOR, 51K, 5%, 1/2W (Composition)	1	Allen Bradley
R8	Com'l	RESISTOR, 47K, 5%, 1/2W (Composition)	1	Allen Bradley
R7	Com'l	RESISTOR, 82K, 5%, 1/2W (Composition)	1	Allen Bradley
R6	Com'l	RESISTOR, 510 Ohms, 5%, 1/2W (Composition)	1	Allen Bradley
R5	Com'l	RESISTOR, 3.3K, 5%, 1/2W (Composition)	1	Allen Bradley
R4	Com'l	RESISTOR, 2.2K, 5%, 1/2W (Composition)	1	Allen Bradley
R1 thru R3	Com'l	RESISTOR, 2K, 5%, 1/2W (Composition)	3	Allen Bradley

REVISIONS				
SYM.	DPPROT	DESCRIPTION	DATE	APPROVAL



28000-099
SHEET 2

2 ALL DIODES ARE IN 625

1. ALL RESISTORS ARE CARBON, 1/2 W, 5 %

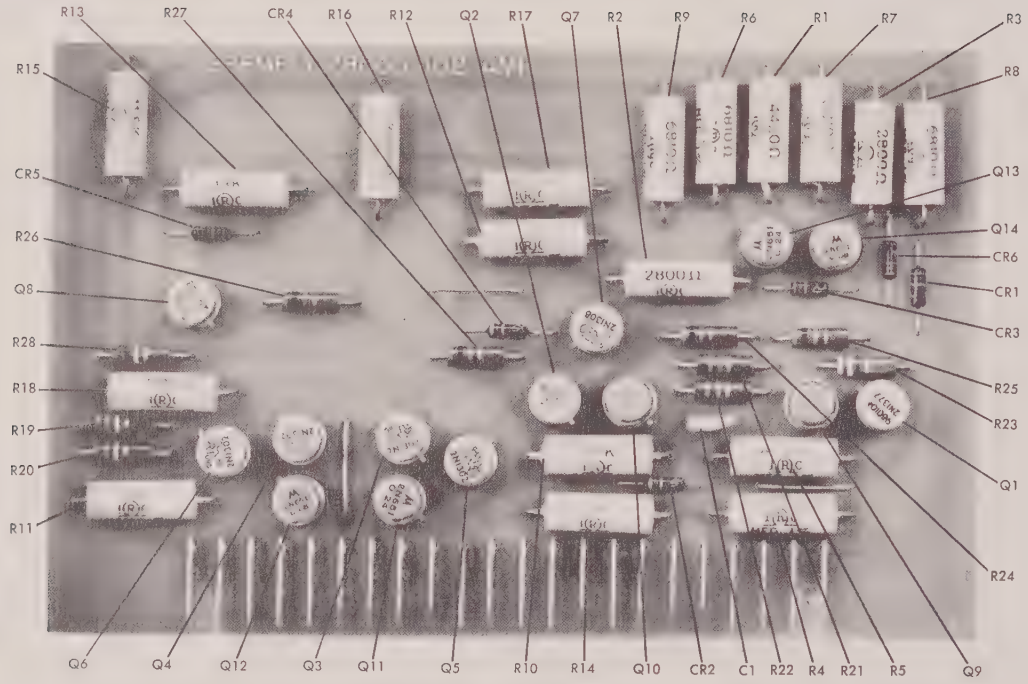
NOTES: UNLESS OTHERWISE SPECIFIED

APPLICATION	QTY REQD

UNLESS OTHERWISE SPEC. P.E.S.
DIMENSIONS ARE IN INCHES
TOLERANCES ON
FRACTION DECIMAL ANGLES
± ± °
MATERIAL
DRAWN SHACKLETON 6 6 6
FINISH

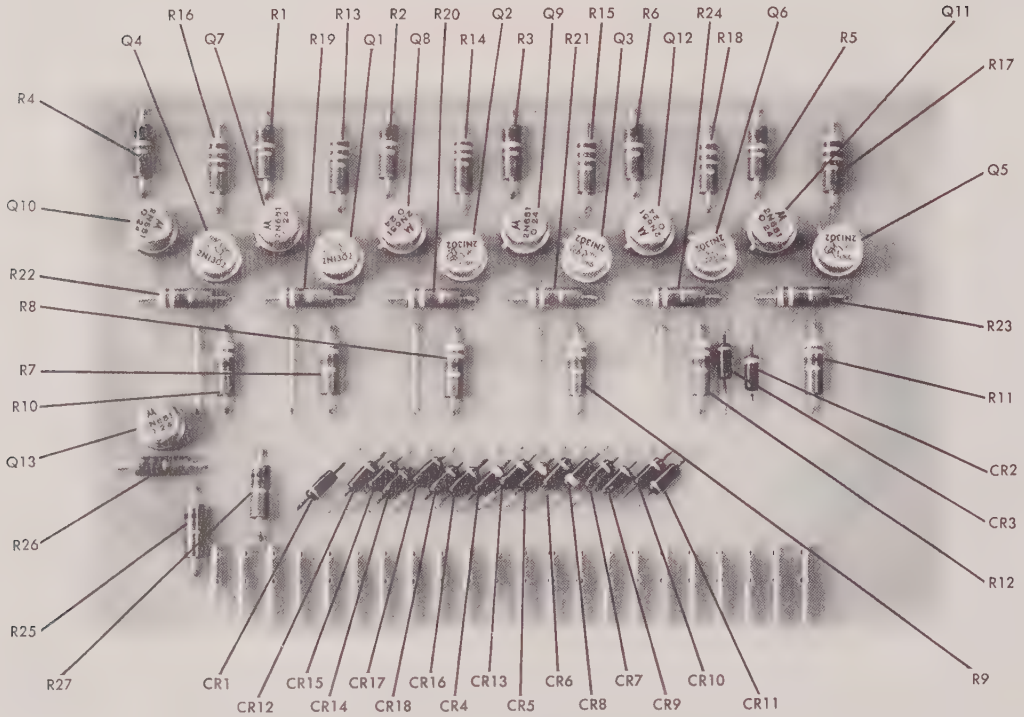
TITLE
SCHEMATIC - ONE SHOT & SLOW MULTIVIBRATOR
MODEL V44
SCALE
NON-LINEAR SYSTEMS INC
DEL MAR AIRPORT
28000-099

28000-102 AMPLIFIER ASSEMBLY

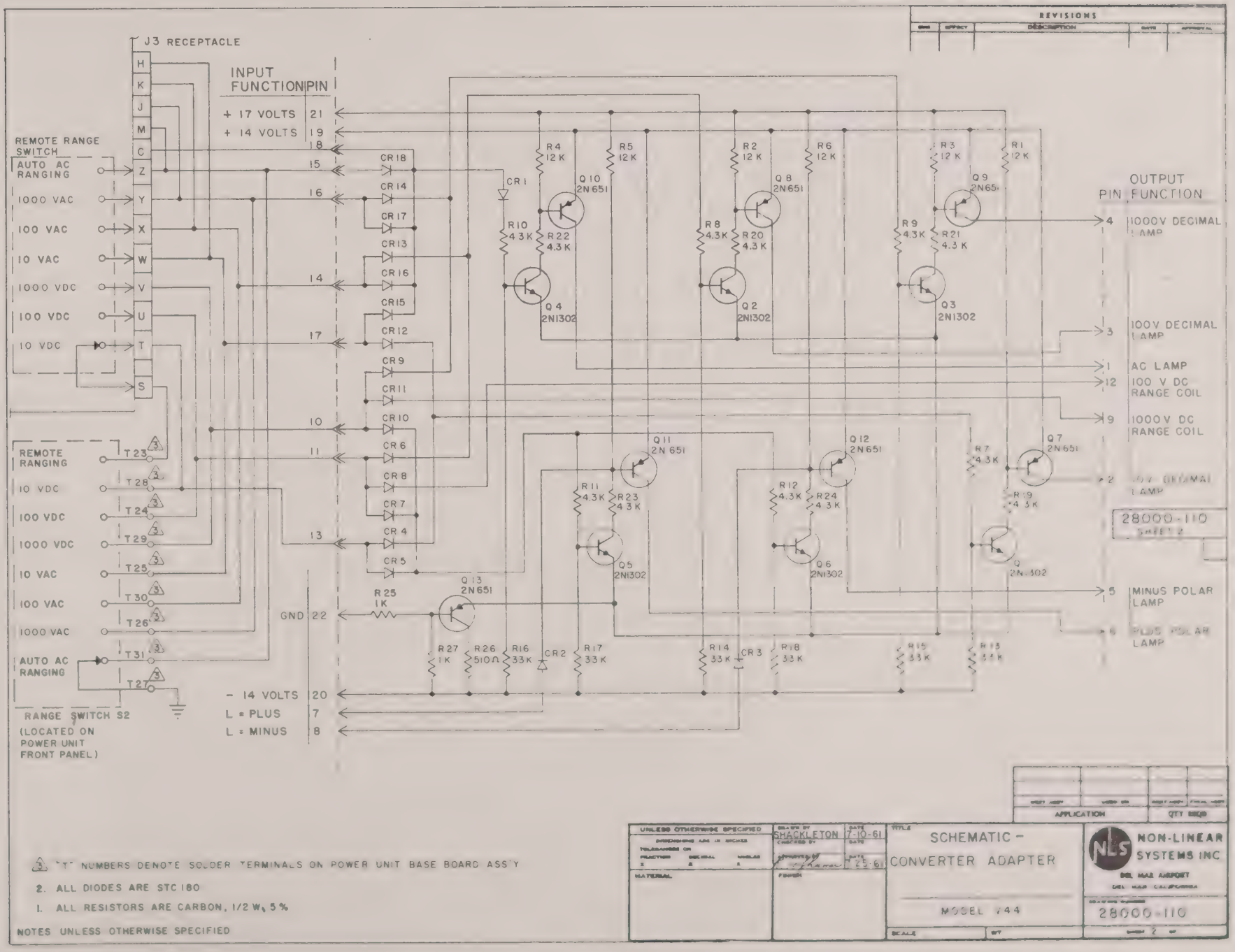


CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
R28	Com'l	RESISTOR, 12K, 1/2W, 5% Composition	1	Allen Bradley
R24 thru R27	Com'l	RESISTOR, 100K, 1/2W, 5% Composition	4	Allen Bradley
R23	Com'l	RESISTOR, 3.9K, 1/2W, 5% Composition	1	Allen Bradley
R21 & R22	Com'l	RESISTOR, 510Ω, 1/2W, 5% Composition	2	Allen Bradley
R19 & R20	Com'l	RESISTOR, 18K, 1/2W, 5% Composition	2	Allen Bradley
R18	Type MEC-T2	RESISTOR, 1.18K, 1/2W, 1% Metal Film	1	IRC
R17	Type MEC-T2	RESISTOR, 1.07K, 1/2W, 1% Metal Film	1	IRC
R16	Type MEC-T2	RESISTOR, 3.24K, 1/2W, 1% Metal Film	1	IRC
R15	Type MEC-T2	RESISTOR, 11.8K, 1/2W, 1% Metal Film	1	IRC
R10 thru R14	Type MEC-T2	RESISTOR, 13.0K, 1/2W, 1% Metal Film	5	IRC
R4 thru R9	Type MEC-T2	RESISTOR, 6.81K, 1/2W, 1% Metal Film	6	IRC
R2 thru R3	Type MEC-T2	RESISTOR, 2.80K, 1/2W, 1% Metal Film	2	IRC
R1	Type MEC-T2	RESISTOR, 4.42K, 1/2W, 1% Metal Film	1	IRC
CR1 thru CR6	1N626	DIODE	6	Rheem
Q11 thru Q14	2N651	TRANSISTOR, PNP	4	Motorola
Q9 & Q10	RT5152	TRANSISTOR, NPN	2	Rheem
Q7 thru Q8	2N1308	TRANSISTOR, NPN	2	Texas Instruments
Q3 thru Q6	2N1302	TRANSISTOR, NPN	4	Texas Instruments
Q1 & Q2	2N1377	TRANSISTOR, PNP	2	Texas Instruments

See Schematic 28000-132



CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
R26	Com'l	RESISTOR, 510Ω, 1/2W, 5% (Composition)	1	Allen Bradley
R25 & R27	Com'l	RESISTOR, 1K, 5%, 1/2W (Composition)	2	Allen Bradley
R13 thru R18	Com'l	RESISTOR, 33K, 5%, 1/2W (Composition)	6	Allen Bradley
R7-12 & R19-24	Com'l	RESISTOR, 4.3K, 5%, 1/2W (Composition)	12	Allen Bradley
R1 thru R6	Com'l	RESISTOR, 12K, 5%, 1/2W (Composition)	6	Allen Bradley
CR1 thru CR18	5003-002	DIODE	18	NLS
Q7 thru Q13	2N651	TRANSISTOR, PNP	7	Motorola
Q1 thru Q6	2N1302	TRANSISTOR, NPN	6	Texas Instruments



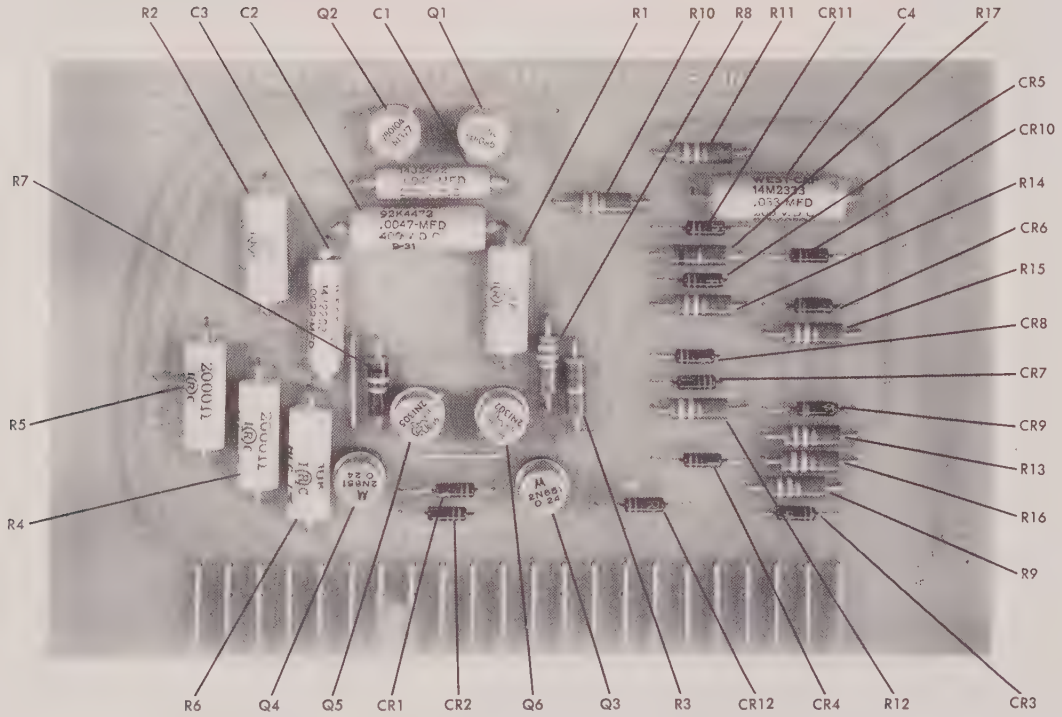
3 "T" NUMBERS DENOTE SOLDER TERMINALS ON POWER UNIT BASE BOARD ASS'Y

2. ALL DIODES ARE STC 180

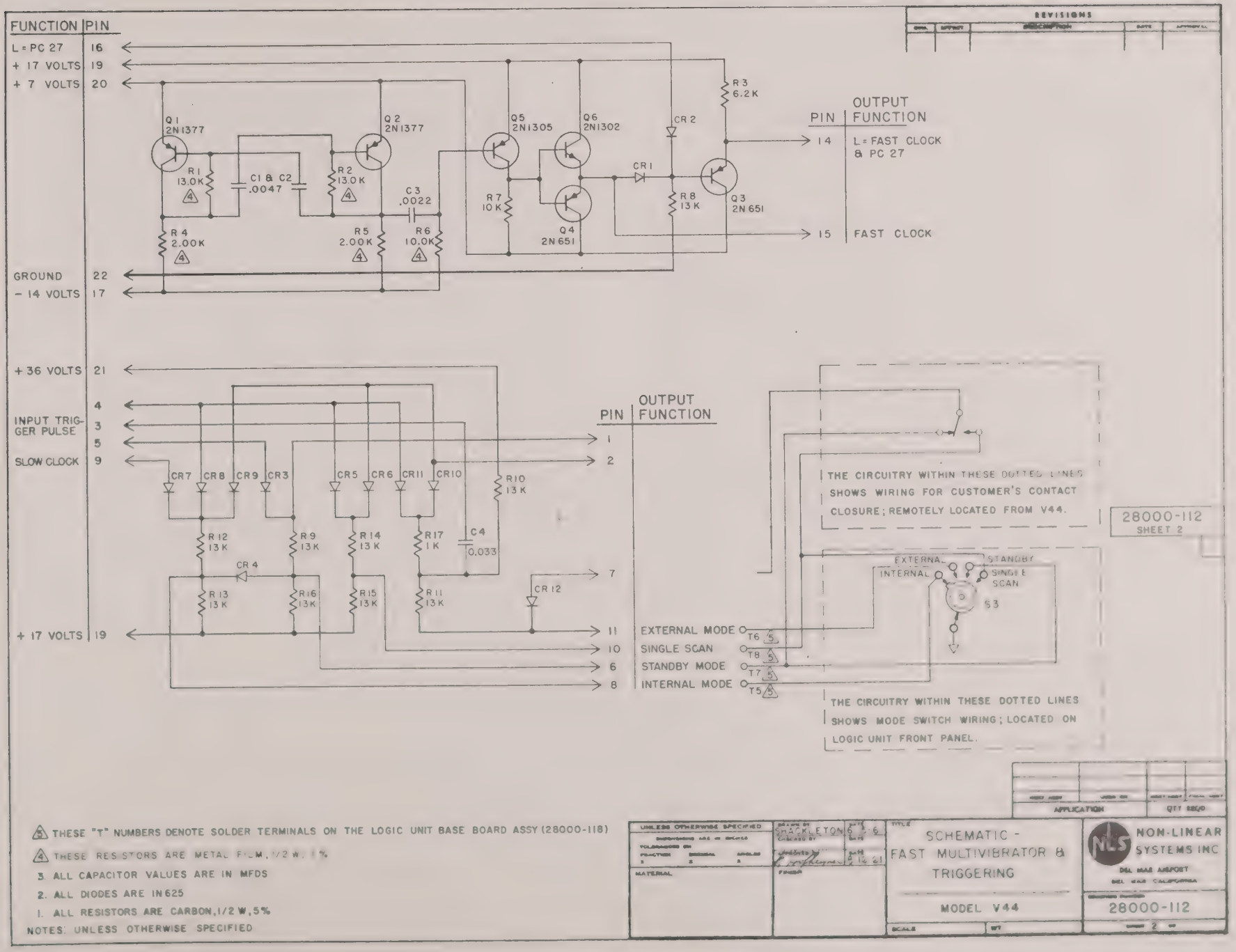
1. ALL RESISTORS ARE CARBON, 1/2 W, 5 %

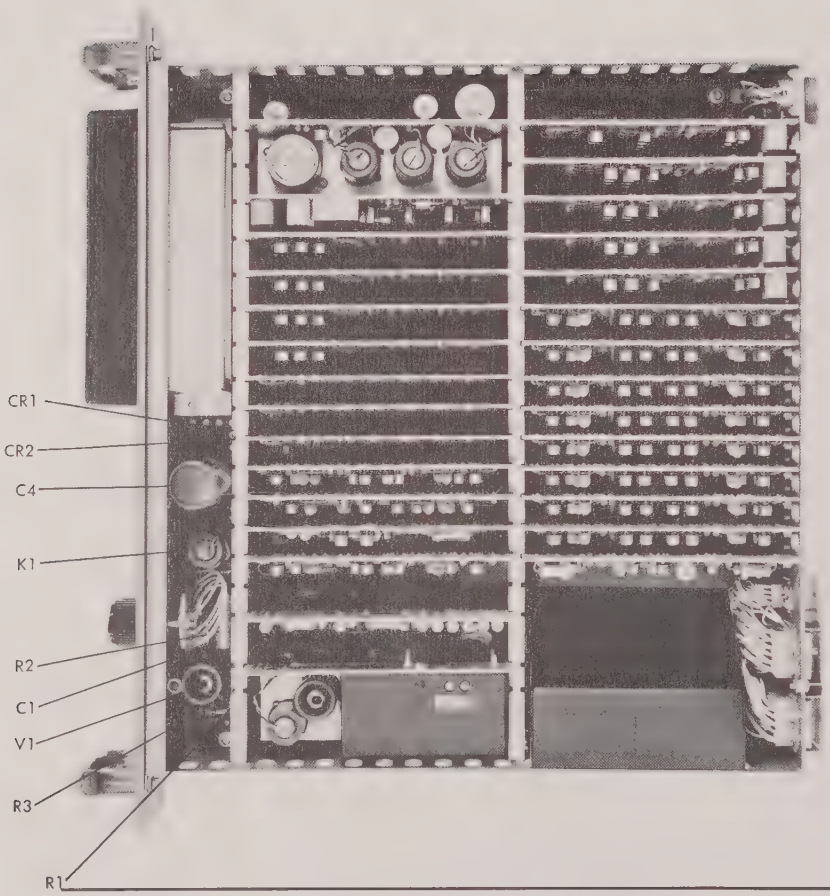
NOTES UNLESS OTHERWISE SPECIFIED

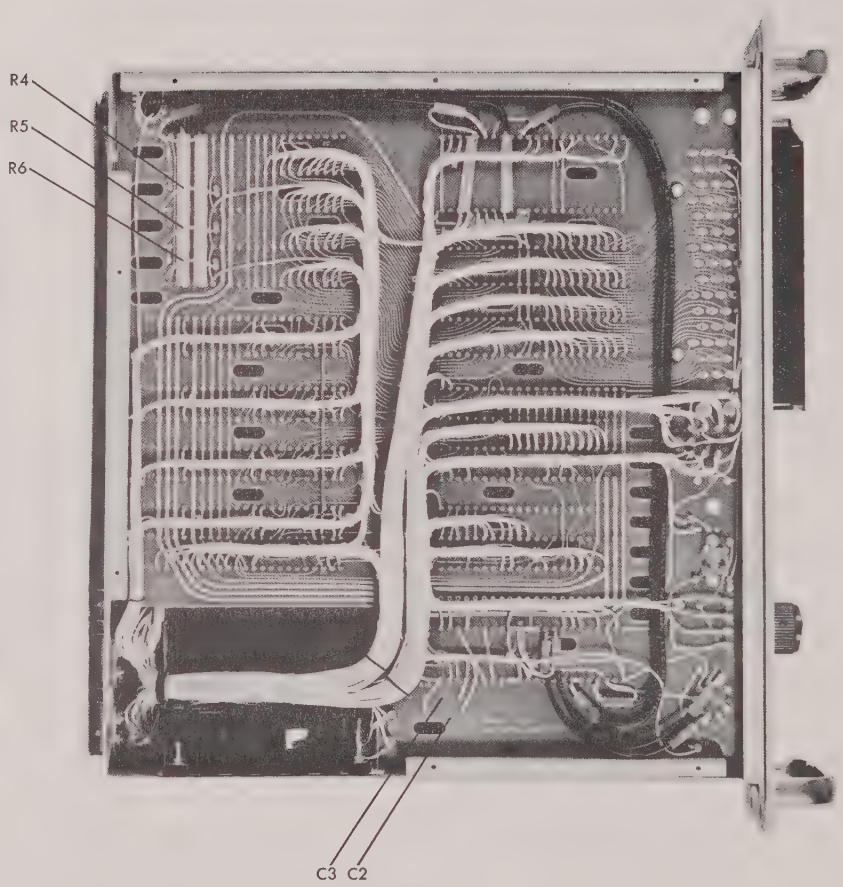
28000-112 FAST MULTIVIBRATOR & TRIGGERING ASSEMBLY



CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
R17	Com'l	RESISTOR, 1K, 1/2W, 5% (Composition)	1	Allen Bradley
R8 thru R16	Com'l	RESISTOR, 13K, 1/2W, 5% (Composition)	9	Allen Bradley
R7	Com'l	RESISTOR, 10K, 1/2W, 5% (Composition)	1	Allen Bradley
R6	Type MEC-T2	RESISTOR, 10.0K, 1/2W, 1% (Metal Film)	1	IRC
R4, R5	Type MEC-T2	RESISTOR, 2.00K, 1/2W, 1% (Metal Film)	2	IRC
R3	Com'l	RESISTOR, 6.2K, 1/2W, 5% (Composition)	1	Allen Bradley
R1 & R2	Type MEC-T2	RESISTOR, 13.0K, 1/2W, 1% (Metal Film)	2	IRC
C1 & C2	14J2472	CAPACITOR, .0047μf, 200V, 5%	2	West-Cap
C4	14M2333	CAPACITOR, .033μf, 200V, 20%	1	West-Cap
C3	14J2222	CAPACITOR, .0022μf, 200V, 5%	1	West-Cap
CR1 thru CR12	1N625	DIODE	12	Hughes
Q6	2N1302	TRANSISTOR, NPN	1	Texas Instruments
Q5	2N1305	TRANSISTOR, PNP	1	Texas Instruments
Q3 & Q4	2N651	TRANSISTOR, PNP	2	Motorola
Q1 & Q2	2N1377	TRANSISTOR, PNP	2	Texas Instruments


FUNCTION
PIN
L = PC 27
16
+ 17 VOLTS
19
+ 7 VOLTS
20
Q1 2N1377
Q2 2N1377
Q5 2N1305
Q6 2N1302
CR2
R3 6.2K
CR1
R1 13.0K
C1 & C2 .0047
R2 13.0K
C3 .0022
R7 10K
R8 13K
Q3 2N651
Q4 2N651
R4 2.00K
R5 2.00K
R6 10.0K
OUTPUT
PIN
FUNCTION
14
L = FAST CLOCK & PC 27
15
FAST CLOCK
GROUND
22
- 14 VOLTS
17
+ 36 VOLTS
21
4
INPUT TRIGGER PULSE
3
5
SLOW CLOCK
9
CR7
CR8
CR9
CR3
CR5
CR6
CR11
CR10
R10 13K
R12 13K
R9 13K
R14 13K
R17 1K
C4 0.033
CR4
CR12
R13 13K
R16 13K
R15 13K
R11 13K
+ 17 VOLTS
19
1
2
7
11
10
6
8
EXTERNAL MODE
SINGLE SCAN
STANDBY MODE
INTERNAL MODE
T6
T8
T7
T5
THE CIRCUITRY WITHIN THESE DOTTED LINES SHOWS WIRING FOR CUSTOMER'S CONTACT CLOSURE; REMOTELY LOCATED FROM V44.
EXTERNAL
INTERNAL
STANDBY
SINGLE SCAN
S3
THE CIRCUITRY WITHIN THESE DOTTED LINES SHOWS MODE SWITCH WIRING; LOCATED ON LOGIC UNIT FRONT PANEL.
REVISIONS
28000-112
SHEET 2
APPLICATION
QTY REQ'D
THESE "T" NUMBERS DENOTE SOLDER TERMINALS ON THE LOGIC UNIT BASE BOARD ASSY (28000-118)
THESE RESISTORS ARE METAL FILM, 1/2 W, 1%
3. ALL CAPACITOR VALUES ARE IN MFDS
2. ALL DIODES ARE IN625
1. ALL RESISTORS ARE CARBON, 1/2 W, 5%
NOTES: UNLESS OTHERWISE SPECIFIED
UNLESS OTHERWISE SPECIFIED
MATERIAL
SHACKLETON
SCHEMATIC - FAST MULTIVIBRATOR & TRIGGERING
MODEL V44
NON-LINEAR SYSTEMS INC
28000-112





CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
V1	5751	TUBE	1	Sylvania (only)
CR1 & CR2	1N625	DIODE	2	Hughes
R6	TYPE AW1224	RESISTOR - 238, 104Ω, ±0.03%	1	NLS
R5	TYPE AW1224	RESISTOR - 226, 253Ω, ±0.03%	1	NLS
R4	TYPE AW1224	RESISTOR - 225, 133Ω, ±0.01%	1	NLS
R2 & R3	Com'l	RESISTOR, 1K, 1/2W, 5% (Composition)	2	Allen Bradley
R1	Com'l	RESISTOR, 5.6Ω, 1W, 5% (Composition)	1	Allen Bradley
C4	20B349	CAPACITOR, 180μf, 200 VDC	1	Industrial Cond.
C2 & C3	DE2-473	CAPACITOR, .047μf, 200 VDC	2	Electron
C1	CPO4A3EB684K	CAPACITOR, .68μf, 100 VDC	1	Sprague
K1	CH1417-15	CHOPPER	1	Bristol

HARNESS ASS'Y POWER UNIT — MODEL V44

CONNECTOR CHART

REAR CONNECTOR	BOTTOM CONN. OR TERMINAL	JUMPER TO	FUNCTION
J4 Solder Lug	T33	T32	Chassis Ground
J4-1 thru -28	Not Used		
J4-29	T37	T15 & T16	115 VAC
J4-30	B7-9		1000 V DC Range Coil
J4-31	T36	T9 & T10	115 VAC (HOT)
J4-32	B3-1		−20 V Precision
J4-33	—	J3-L	
J4-34	B7-12		100 V DC Range Coil
J4-35	T33	J3-E & T32	Chassis Ground
J4-36	T17		Power Ground
J4-37	T18		15.4 VAC
J4-38	T38		+160 VDC
J4-39	B13-1		+14 VDC (Reg.)
J4-40	B11-22		Logic Ground
J4-41	B3-9 & 10		Power Ground
J4-42	B3-9 & 10		Power Ground
J4-43	B13-5		+17 V Reg.
J4-44	B12-22		Logic Ground
J4-45	T8		Power Ground
J4-46	B12-15		80 Millisecond Record Pulse
J4-47	B7-7		L = + (Plus)
J4-48	B7-3		100 V Decimal Lite
J4-49	T8		Power Ground
J4-50	B8-15		L = 1 6th Stage Counter
J4-51	B13-6		+7 VDC (Reg.)
J4-52	B7-2		10 V Decimal Lite
J4-53	B12-1		Slow Multivibrator
J4-54	B9-13		L = 0 4th Stage Counter
J4-55	B12-22		Logic Ground
J4-56	B7-4		1000 V Decimal Lite
J4-57	B12-6		8 Microsecond Record Pulse
J4-58	B9-4		L = 1 3rd Stage Counter
J4-59	B1-1		−14 VDC (Reg.)
J4-60	B12-10		L = Step 55
J4-62	B13-4		−24 VDC (Reg.)
J4-63	B8-9		L = 0 5th Stage Counter
J4-64	B12-11		Fast Multivibrator
J4-65	B9-15		L = 1 4th Stage Counter
J4-66	B11-1		Counter Matrix Reset
J4-67	B9-9		L = 0 3rd Stage Counter
J4-70	B7-8		L = − (Minus)
J4-71	B10-4		L = 1 1st Stage Counter
J4-72	B7-6		+ Polarity Lite
J4-73	B10-15		L = 1 2nd Stage Counter
J4-74	B13-7		+36 VDC (Reg.)
J4-75	B8-13		L = 0 6th Stage Counter
J4-76	B7-5		−Polarity Lite
J4-77	B8-4		L = 1 5th Stage Counter
J4-78	B1-2		−36 VDC (Reg.)
J4-79	B10-13		L = 0 2nd Stage Counter
J4-80	B7-1		AC Lite
J4-82	B10-9		L = 0 1st Stage Counter
J3-A	T36		115 VAC (Hot)
J3-B	T37		115 VAC

HARNESS ASS'Y POWER UNIT — MODEL V44 (Cont.)

CONNECTOR CHART

REAR CONNECTOR	BOTTOM CONN. OR TERMINAL	JUMPER TO	FUNCTION
J3-C	B7-18		AC Mode
J3-D	Not Used		
J3-E	T33	J4 Solder Lug	Chassis Gnd.
J3-F	Not Used		
J3-H	B7-17	T25	10 VAC
J3-J	B7-16	T26	1000 VAC
J3-K	B7-14	T30	100 VAC
J3-L	—	J4-33	Converter & Logic Gnd.
J3-M	B7-15	T31	Auto AC Ranging
J3-N	Not Used		
J3-P	Not Used		
J3-R	Not Used		
J3-S	T23		Remote Ranging
J3-T	B7-13	T28	10 VDC
J3-U	B7-11	T24	100 VDC
J3-V	B7-10	T29	1000 VDC
J3-W	T25		10 VAC
J3-X	T30		100 VAC
J3-Y	T26		1000 VAC
J3-Z	T31		Auto AC Ranging
J3-AA thru NN	Not Used		
	T19	T34	115 VAC
	T20	T35	115 VAC (Hot)
	B12-9	T21	L = Record
	B7-22	T27	Logic Ground

HARNESS ASS'Y LOGIC UNIT — MODEL V44

J5-1 thru -28	Not Used		
J5-29	T-12, & A1-21	Muffin Fan	115 VAC
J5-30	A16-4		1000V Relay Coil
J5-31	T13, & A1-22	Muffin Fan	115 VAC (Hot)
J5-32	A15-4	A2-8 & 9	−20 V Precision
J5-33	A2-3 & 4		0 V Precision
J5-34	A16-5		100 V Relay Coil
J5-35	—	J5 Chassis Solder Lug	Chassis Ground
J5-36	T20		Power Ground
J5-37	A1-15		15.4 VAC
J5-38	A16-22		+160 VDC
J5-39	A30-9		+14 VDC Reg
J5-40	A29-1		Logic Ground
J5-41	A2-3 & 4		0 V Precision
J5-42	A2-3 & 4		0 V Precision
J5-43	A30-7		+17 VDC Reg.
J5-44	A30-3		Logic Ground
J5-45	T20		Power Ground
J5-46	—	J7-49	80 millisecond Record Pulse
J5-47	A30-22	A18-14	L = + (plus)
J5-48	T18	T32	100 V Decimal Lite
J5-49	T20		Power Ground
J5-50	A9-11		L = 1, 6th Stage Counter
J5-51	A30-5		+7 VDC Reg.
J5-52	T17	T31	10 V Decimal Lite
J5-53	A12-9		Slow multivibrator
J5-54	A9-16		L = 0, 4th stage counter

HARNESS ASS'Y LOGIC UNIT — MODEL V44 (Cont.)

CONNECTOR CHART

REAR CONNECTOR	BOTTOM CONN. OR TERMINAL	JUMPER TO	FUNCTION
J5-55	A29-1		Logic Ground
J5-56	T16	T33	1000 V Decimal Lite
J5-57	—	J6-Y	8 microsecond record pulse
J5-58	A9-13		L = 1, 3rd stage counter
J5-59	A30-10		−14 VDC Reg.
J5-60	A13-9	A7-1	Bit 55
J5-62	A30-8		−24 VDC (Reg.)
J5-63	A9-10		L = 0, 5th stage counter
J5-64	A30-21		Fast multivibrator
J5-65	A9-15		L = 1, 4th stage counter
J5-66	A11-1		Counter matrix reset
J5-67	A9-14		L = 0, 3rd stage counter
J5-70	A30-6	A18-13	L = − (minus)
J5-71	A9-17		L = 1, 1st stage counter
J5-72	T14	T29	+ Polarity Lite
J5-73	A9-19		L = 1, 2nd stage counter
J5-74	A30-4	A15-1	+36 VDC Reg.
J5-75	A9-12		L = 0, 6th stage counter
J5-76	T15	T28	− Polarity Lite
J5-77	A9-9		L = 1, 5th stage counter
J5-78	A30-12	A21-7	−36 VDC Reg.
J5-80	T21	T27	AC Lite
J5-82	A9-18		L = 0, 1st stage counter
J5-79	A9-20		L = 0, 2nd stage counter
J6-A	A23-19		Units Decade−2
J6-B	A27-19		Hundreds Decade−2
J6-C	A25-19		Tens Decade−2
J6-D	A29-19		Thousands Decade−2
J6-E	A23-21		Units Decade−4
J6-F	A27-21		Hundreds Decade−4
J6-H	A25-21		Tens Decade−4
J6-J	A29-21		Thousands Decade−4
J6-K	A22-19		Units Decade−2*
J6-L	A26-19		Hundreds Decade−2*
J6-M	A24-19		Tens Decade−2*
J6-N	A28-19		Thousands Decade−2*
J6-P	A22-21		Units Decade−1
J6-R	A26-21		Hundreds Decade−1
J6-S	A24-21		Tens Decade−1
J6-T	A28-21		Thousands Decade−1
J6-U	A30-20		L = + (plus)
J6-V	T17		10 V Decimal Lite
J6-W	T18		100 V Decimal Lite
J6-X	T16		1000 V Decimal Lite
J6-Y	—	J5-57	8 microsecond record pulse
J6-Z	A12-3		Short negative pulse
J6-AA	A30-3		Logic ground
J6-BB	—	J5 Chassis Solder Lug	Chassis ground
J6-CC	Spare		
J6-DD	Spare		
J7-1	Spares		
J7-2	T18		100 V Decimal Lite
J7-3	Spare		
J7-4	A3-10		+14 VDC Reg.
J7-5	T17		10 V Decimal Lite
J7-7	T16		1000 V Decimal Lite

HARNESS ASS'Y LOGIC UNIT — MODEL V44 (Cont.)

CONNECTOR CHART

REAR CONNECTOR	BOTTOM CONN. OR TERMINAL	JUMPER TO	FUNCTION
J7-8	A3-13		1000's Decade — Number 0
J7-10	A5-13		10's Decade — Number 0
J7-11	Spare		
J7-12	Spare		
J7-13	A4-13		100's Decade — Number 0
J7-14	A6-13		1's Decade — Number 0
J7-15	A3-14		1000's Decade — Number 1
J7-16	A5-14		10's Decade — Number 1
J7-17	Spare		
J7-18	T14		+ Polarity
J7-20	A4-14		100's Decade — Number 1
J7-21	A6-14		1's Decade — Number 1
J7-22	A3-15		1000's Decade — Number 2
J7-23	A5-15		10's Decade — Number 2
J7-24	Spare		
J7-25	T15		− Polarity
J7-26	A4-15		100's Decade — Number 2
J7-27	A6-15		1's Decade — Number 2
J7-28	A3-16		1000's Decade — Number 3
J7-29	A5-16		10's Decade — Number 3
J7-30	Spare		
J7-31	Spare		
J7-32	A4-16		100's Decade — Number 3
J7-33	A6-16		1's Decade — Number 3
J7-34	A3-17		1000's Decade — Number 4
J7-35	A5-17		10's Decade — Number 4
J7-36	Spare		
J7-37	Spare		
J7-38	A4-17		100's Decade — Number 4
J7-39	A6-17		1's Decade — Number 4
J7-40	A3-18		1000's Decade — Number 5
J7-41	A5-18		10's Decade — Number 5
J7-42	Spare		
J7-43	Spare		
J7-44	A4-18		100's Decade — Number 5
J7-45	A6-18		1's Decade — Number 5
J7-46	A3-19		1000's Decade — Number 6
J7-47	A5-19		10's Decade — Number 6
J7-48	Spare		
J7-49	—	J5-46	80 millisecond record pulse
J7-50	A4-19		100's Decade — Number 6
J7-51	A6-19		1's Decade — Number 6
J7-52	A3-20		1000's Decade — Number 7
J7-53	A5-20		10's Decade — Number 7
J7-54	Spare		
J7-55	Spare		
J7-56	A4-20		100's Decade — Number 7
J7-57	A6-20		1's Decade — Number 7
J7-58	A3-21		1000's Decade — Number 8
J7-59	A5-21		10's Decade — Number 8
J7-60	Spare		
J7-62	T20		Power Ground
J7-63	A4-21		100's Decade — Number 8
J7-64	A6-21		1's Decade — Number 8
J7-65	A3-22		1000's Decade — Number 9
J7-66	A5-22		10's Decade — Number 9
J7-67	Spare		
J7-70	Spare		

HARNESS ASS'Y LOGIC UNIT — MODEL V44 (Cont.)

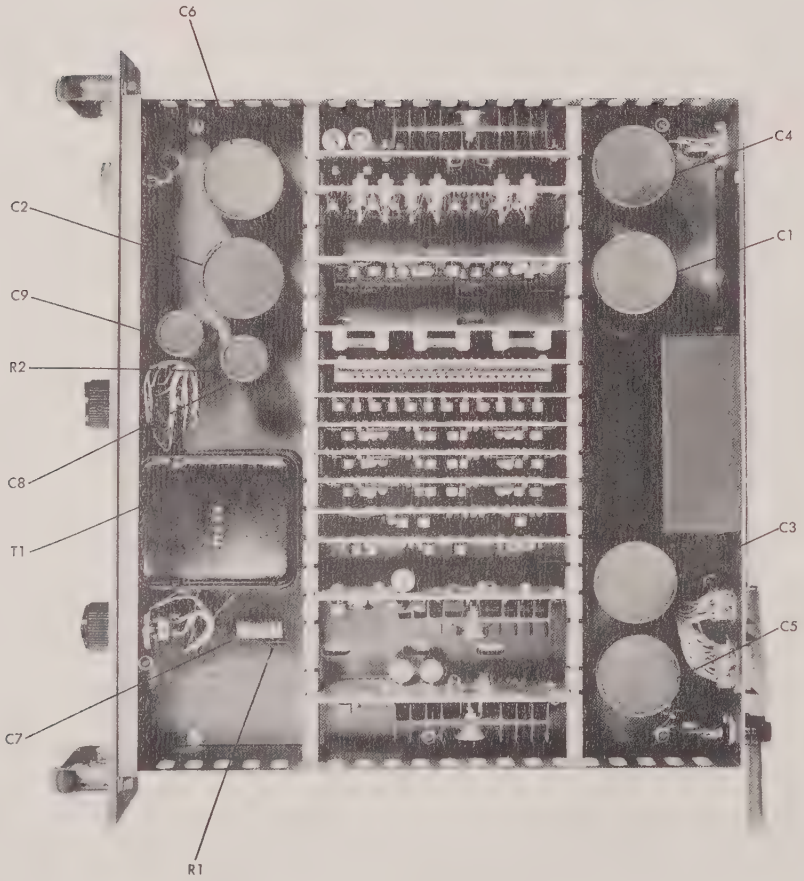
CONNECTOR CHART

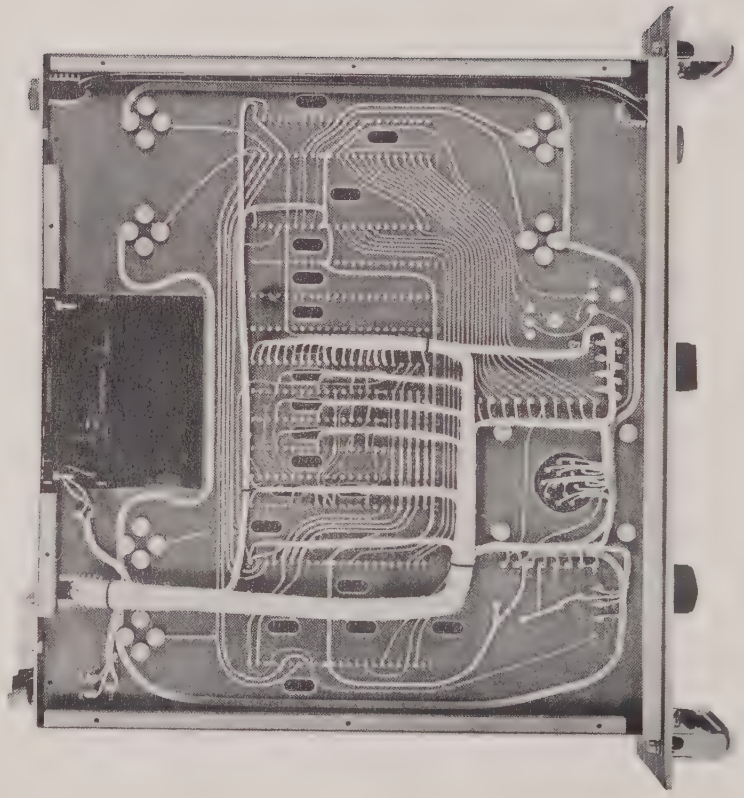
REAR CONNECTOR	BOTTOM CONN. OR TERMINAL	JUMPER TO	FUNCTION
J7-71	A4-22		100's Decade — Number 9
J7-72	A6-22		1's Decade — Number 9
J7-73	Spare		
J7-74	Spare		
J7-75	Spare		
J7-76	A12-7		Start Trigger Ext. — Wiper
J7-77	T21		+14 VDC on AC measure
J7-78	T19		+14 VDC on DC measure
J7-79	A12-6	T7	Start Trigger Ext.— Normally closed
J7-80	A12-10	T8	Start Trigger Ext.— Normally open
J7-82	Spare		
J8-A	A16-16 & -17	(Shielded)	Hot Input
J8-B	A17-5 & -6		Signal ground
J8-C	—	J5 Chassis Solder Lug	Chassis ground
	A1-2	A16-3	Chopper Drive
	A1-3	A10-4	L = 1, No. 1 Chopper Drive
	A1-12	T-22	Chopper Drive
	A1-11	A10-13	L = 2, No. 2 Chopper Drive
	A1-16	T-20	Power ground
	A1-10	A16-19 (Shielded)	Reference Output
	A1-6	A17-1 (Shielded)	Ladder Output
	A1-4 & -5	From white shield ground of above	Shield ground
	A2-5	A15-2 & A19-7	−36 VDC Reg.
	A2-6	A19-11	−24 VDC Reg.
	A2-7	A13-17&A16-11	−14 VDC Reg.
	A6-7	A13-16	Hyster, FF No. 1, Zero
	A6-8	A13-8	Hyster, FF No. 1, Set
	A7-2	A10-16	Bit 63
	A8-1	A10-2	Bit 60-63
	A10-9	A16-2	L = 0, No. 1 Chopper Drive
	A10-15	T23	L = 1, No. 2 Chopper Drive
	A12-8	T5	To Mode Switch Int. Pos.
	A12-11	T6	To Mode Switch Ext. Pos.
	A13-13	A17-16	L = 0 Hysteresis
	A13-18	A15-17	+17 VDC Reg.
	A13-20	A15-16	+7 VDC Reg.
	A15-9 & -10	A2-3 & -4	Amplifier Ground
	A15-13	T-9 (Shielded)	V1B Cathode (Base Board)
	A15-14	T-10 (Shielded)	V1A Cathode (Base Board)

HARNESS ASS'Y LOGIC UNIT — MODEL V44 (Cont.)

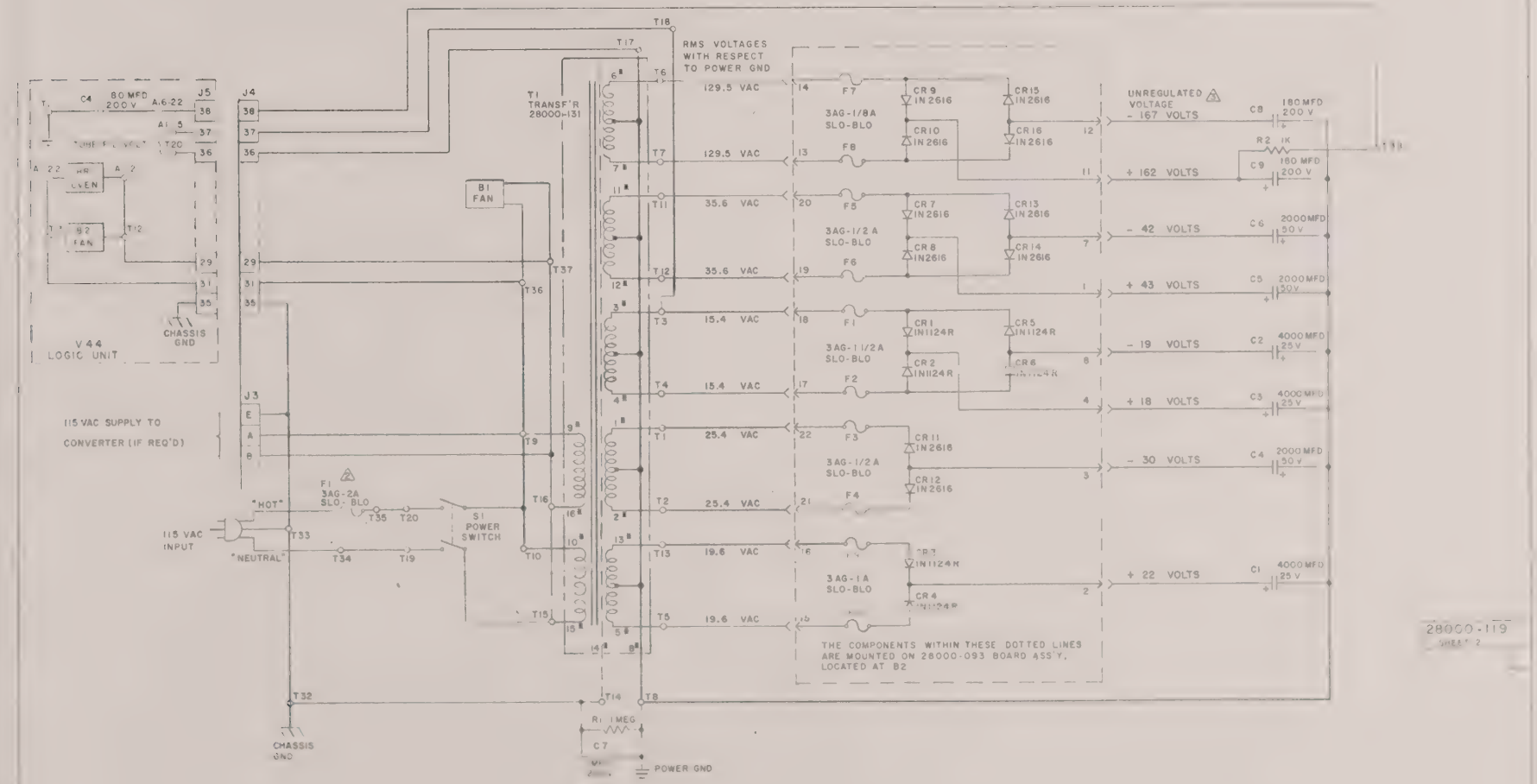
CONNECTOR CHART

REAR CONNECTOR	BOTTOM CONN. OR TERMINAL	JUMPER TO	FUNCTION
	A15-15	A30-2	A
	A15-19	A30-1	A
	A16-9 & -10	A2-3 & -4	Signal Ground
	A16-11	A13-17 & T11	−14 VDC Reg.
	A16-20	Shield Ground from A16-19	Amplifier Ground
	A17-15	A13-4	Hysteresis L = 1
	A18-15	A28-22	Thousands Decade, L = 1
	A18-16	A28-13	Thousands Decade, L = 1
	A18-17	A28-4	Thousands Decade, L = 2*
	A18-18	A28-12	Thousands Decade, L = 2*
	A18-19	A29-22	Thousands Decade, L = 4
	A18-20	A29-13	Thousands Decade, L = 4
	A18-21	A29-4	Thousands Decade, L = 2
	A18-22	A29-12	Thousands Decade, L = 2
	A19-1	T24	Hundreds Decade switch output
	A19-15	A26-22	Hundreds Decade, L = 1
	A19-16	A26-13	Hundreds Decade, L = 1
	A19-17	A26-4	Hundreds Decade, L = 2*
	A19-18	A26-12	Hundreds Decade, L = 2*
	A19-19	A27-22	Hundreds Decade, L = 4
	A19-20	A27-13	Hundreds Decade, L = 4
	A19-21	A27-4	Hundreds Decade, L = 2
	A19-22	A27-12	Hundreds Decade, L = 2
	A20-1	T25	Tens Decade switch output
	A20-15	A24-22	Tens Decade, L = 1
	A20-16	A24-13	Tens Decade, L = 1
	A20-17	A24-4	Tens Decade, L = 2*
	A20-18	A24-12	Tens Decade, L = 2*
	A20-19	A25-22	Tens Decade, L = 4
	A20-20	A25-13	Tens Decade, L = 4
	A20-21	A25-4	Tens Decade, L = 2
	A20-22	A25-12	Tens Decade, L = 2
	A21-1	T26	Units Decade switch output
	A21-15	A22-22	Units Decade, L = 1
	A21-16	A22-13	Units Decade, L = 1
	A21-17	A22-4	Units Decade, L = 2*
	A21-18	A22-12	Units Decade, L = 2*
	A21-19	A23-22	Units Decade, L = 4
	A21-20	A23-13	Units Decade, L = 4
	A21-21	A23-4	Units Decade, L = 2
	A21-22	A23-12	Units Decade, L = 2
	A30-21	A29 20 thru A22-20	Fast clock





CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
T1	50194E	TRANSFORMER	1	Elect. Maint.
R2	Com'l	RESISTOR, 1K, 1/2W, 5%	1	Allen Bradley
R1	Com'l	RESISTOR, 1 Meg, 1/2W, 5%	1	Allen Bradley
C8, C9	20B349	CAPACITOR, 180μ, 200V	2	Industrial Cond.
C7	D2-105	CAPACITOR, 1.0μf, 200V	1	Electron
C4, C5, C6	1B1245A-RRK	CAPACITOR, 2000μf, 50V	3	Industrial Cond.
C1, C2, C3	1B1246A-RRK	CAPACITOR, 4000μf, 25V	3	Industrial Cond.



28000-119

SHEET 2

⚠ THESE ARE NOMINAL VOLTAGES BASED ON 115VAC, 60 CYCLE INPUT

⚠ REPLACE WITH 2.5 AMP FUSE WHEN USED WITH CONVERTER.

1. NUMBERS DENOTED BY 8 ARE TRANSFORMER HEADER NUMBERS

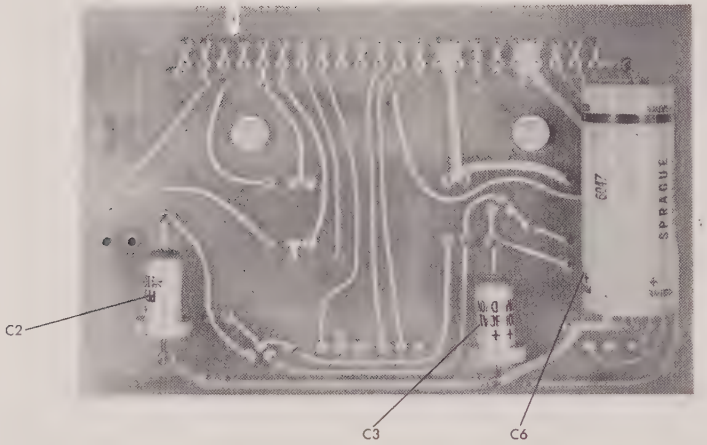
NOTES UNLESS OTHERWISE SPECIFIED

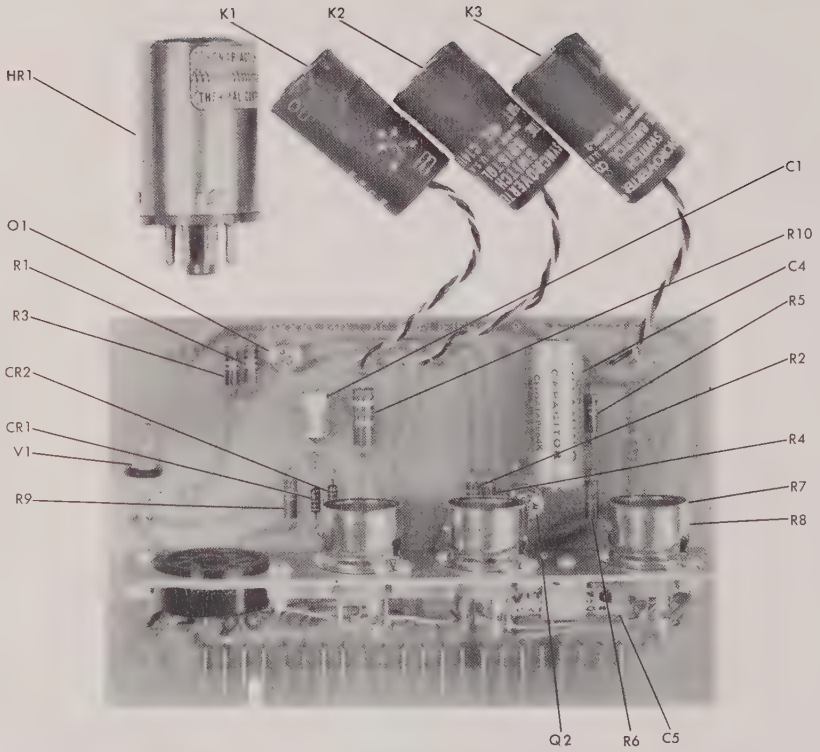
SCHEMATIC - UNREGULATED POWER SUPPLY - 115 VAC INPUT

MODEL V44

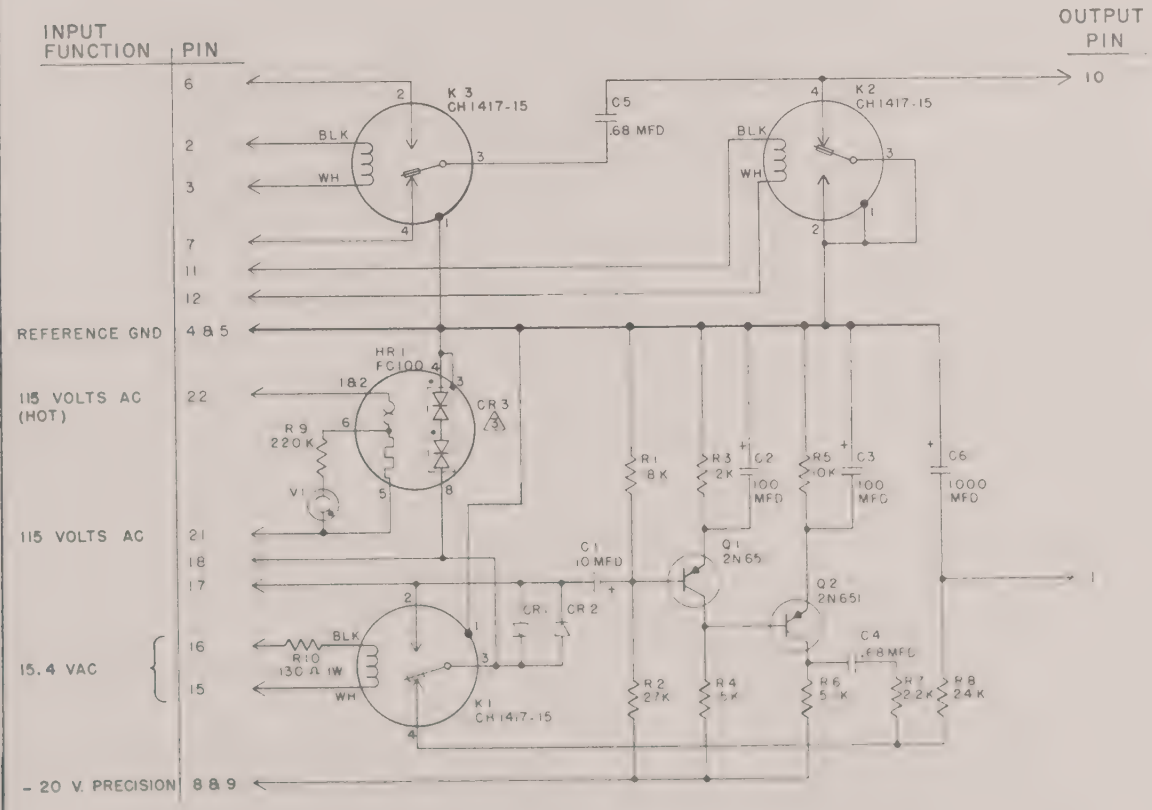
NLS NON LINEAR SYSTEMS INC

28000-119





CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
HR1	FC-100	OVEN	1	Bulova
K1, K2, K3	CH1417-15	CHOPPER	3	Bristol
Q1, Q2	2N651	TRANSISTOR, PNP	2	Motorola
R10	Com'l	RESISTOR, 130 Ohms, 1W, 5%	1	Allen Bradley
R9	Com'l	RESISTOR, 220K, 1/2W, 5%	1	Allen Bradley
R8	Com'l	RESISTOR, 24K, 1/2W, 5%	1	Allen Bradley
R7	Com'l	RESISTOR, 2.2K, 1/2W, 5%	1	Allen Bradley
R6	Com'l	RESISTOR, 5.1K, 1/2W, 5%	1	Allen Bradley
R5	Com'l	RESISTOR, 10K, 1/2W, 5%	1	Allen Bradley
R4	Com'l	RESISTOR, 15K, 1/2W, 5%	1	Allen Bradley
R3	Com'l	RESISTOR, 12K, 1/2W, 5%	1	Allen Bradley
R2	Com'l	RESISTOR, 27K, 1/2W, 5%	1	Allen Bradley
R1	Com'l	RESISTOR, 18K, 1/2W, 5%	1	Allen Bradley
V1	90-ST-2-32	TUBE, NEON	1	Signalite
CR3	020359A	DIODE, ZENER (MATCHED PAIR)	1	Hoffman
CR1, CR2	1N625	DIODE	2	Hughes
C6	TVA1163	CAPACITOR, 1000μf, 15W, VDC	1	Sprague
C4, C5	CPO4A1EB684K	CAPACITOR, .68μf, 100W, VDC	2	Sprague
C2, C3	PP100B30A2	CAPACITOR, 100μf, 30W, VDC (Tantalum)	2	Fansteel
C1	PP10B25A2	CAPACITOR, .10μf, 25W, VDC (Tantalum)	1	Fansteel



REVISIONS

SYM.	SHEET	DESCRIPTION	DATE	APPROVED

28000-123
SHEET 2

APPLICATION			

UNLESS OTHERWISE SPECIFIED

DRAWN BY S. HAMILTON 6 20 61

MATERIAL

TITLE
SCHEMATIC -
AC AMPLIFIER, -20 V
PRECISION SUPPLY

MODEL V44

NON-LINEAR SYSTEMS INC
DEL MAR, CALIFORNIA

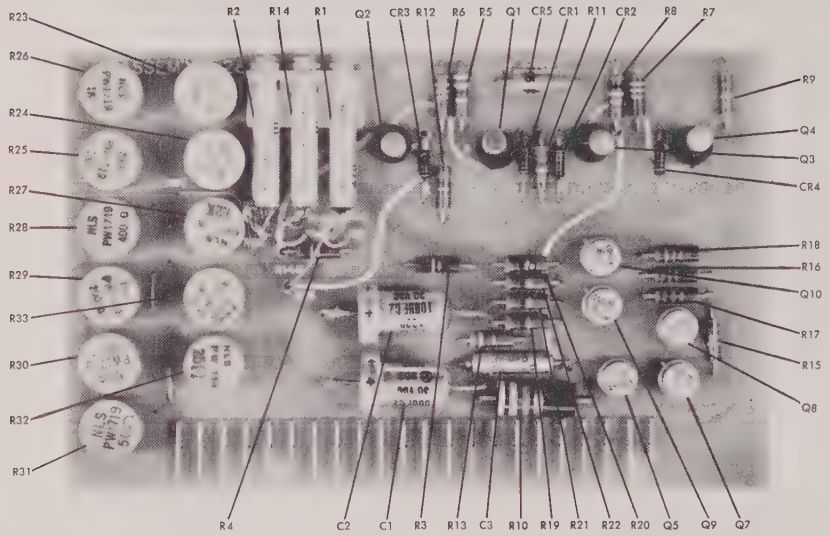
28000-123

SCALE WT SHEET 2 OF

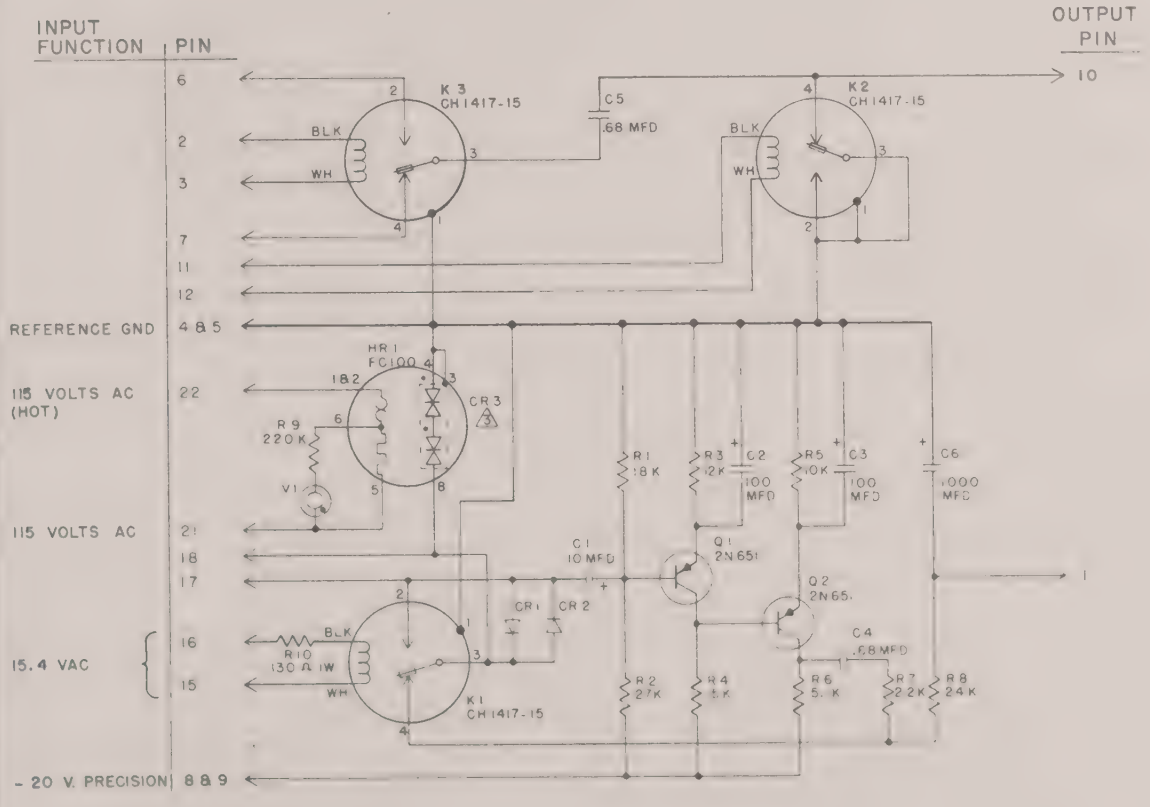
NOTES UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE CARBON, 1/2 W, 5 %
2. ALL DIODES ARE IN625
3. LOCATED IN OVEN B CONSISTS OF A MATCHED PAIR OF DIODES - 020359A

28000-125 DC AMPLIFIER, —20V Precision Supply



CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
Q7 thru Q10	2N1302	TRANSISTOR, PNP	4	Texas Instruments
Q5	2N1305	TRANSISTOR, PNP	1	Texas Instruments
Q1 thru Q4	2N274	TRANSISTOR, PNP	4	Texas Instruments
R33	PW1719	RESISTOR, 12 Ohms, 1/2W, 1%, WW	1	NLS
R32	PW1719	RESISTOR, 25 Ohms, 1/2W, 1%, WW	1	NLS
R31	PW1719	RESISTOR, 50 Ohms, 1/2W, 1%, WW	1	NLS
R30	PW1719	RESISTOR, 100 Ohms, 1/2W, 1%, WW	1	NLS
R29	PW1719	RESISTOR, 200 Ohms, 1/2W, 1%, WW	1	NLS
R28	PW1719	RESISTOR, 400 Ohms, 1/2W, 1%, WW	1	NLS
R27	PW1719	RESISTOR, 1.2K, 1/2W, 1%, WW	1	NLS
R25, R26	PW1719	RESISTOR, 1K, 1/2W, 1%, WW	2	NLS
R23, R24	PW1719	RESISTOR, 5K, 1/2W, (Matched pair to .004% WW)	2	NLS
R19 thru R22		RESISTOR, 62 Ohms, 1/2W, 5%	4	Allen Bradley
R15 thru R18		RESISTOR, 180 Ohms, 1/2W, 5%	4	Allen Bradley
R13		RESISTOR, 3.9K, 1/2W, 5%	1	Allen Bradley
R12		RESISTOR, 5.1K, 1/2W, 5%	1	Allen Bradley
R11		RESISTOR, 7.5K, 1/2W, 5%	1	Allen Bradley
R10		RESISTOR, 430 Ohms, 2W, 5%	1	Allen Bradley
R9		RESISTOR, 1.2K, 1/2W, 5%	1	Allen Bradley
R8		RESISTOR, 10K, 1/2W, 5%	1	Allen Bradley
R6, R7		RESISTOR, 13K, 1/2W, 5%	2	Allen Bradley
R5		RESISTOR, 4.3K, 12W, 5%	1	Allen Bradley
R3, R4		RESISTOR, 20K, 1/2W, 5%	2	Allen Bradley
R2, R14	0271L-1-17	POTENTIOMETER, 17 Ohm	2	Conelco
R1	0250L-1-20K	POTENTIOMETER, 20K Ohm	1	Conelco
CR5	M2725	ZENER DIODE, 27V ±5%, 3/4W	1	Motorola
CR1 thru CR4	1N625	DIODE	4	Hughes
C3	14M1103	CAPACITOR, .01μf, 100VDC	1	West Cap
C1, C2	PP100B30A2	CAPACITOR, 100μf, 30WVDC (Tantalum)	2	Fansteel



28000-123
SHEET 2

REVISIONS

SYM	BY/DAT	DESCRIPTION	DATE	APPROVED

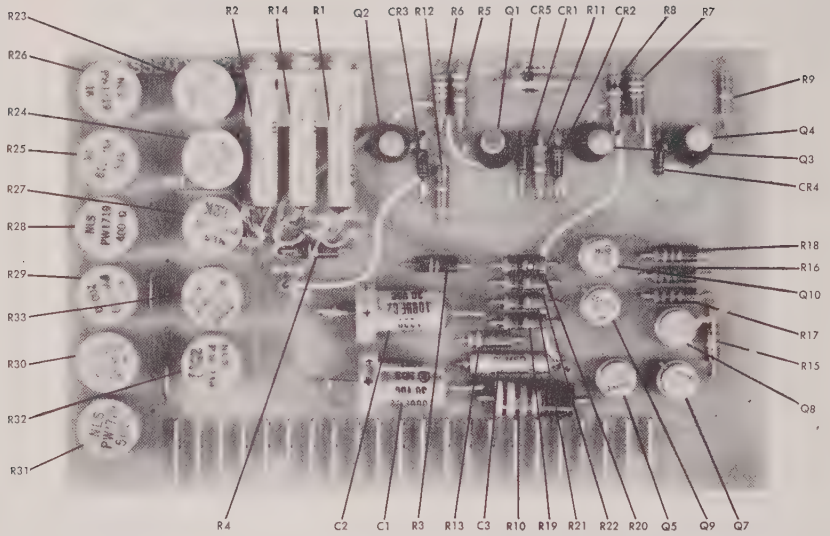
NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS ARE CARBON, 1/2 W, 5 %
2. ALL DIODES ARE IN625
3. LOCATED IN OVEN B CONSISTS OF A MATCHED PAIR OF DIODES C20359A

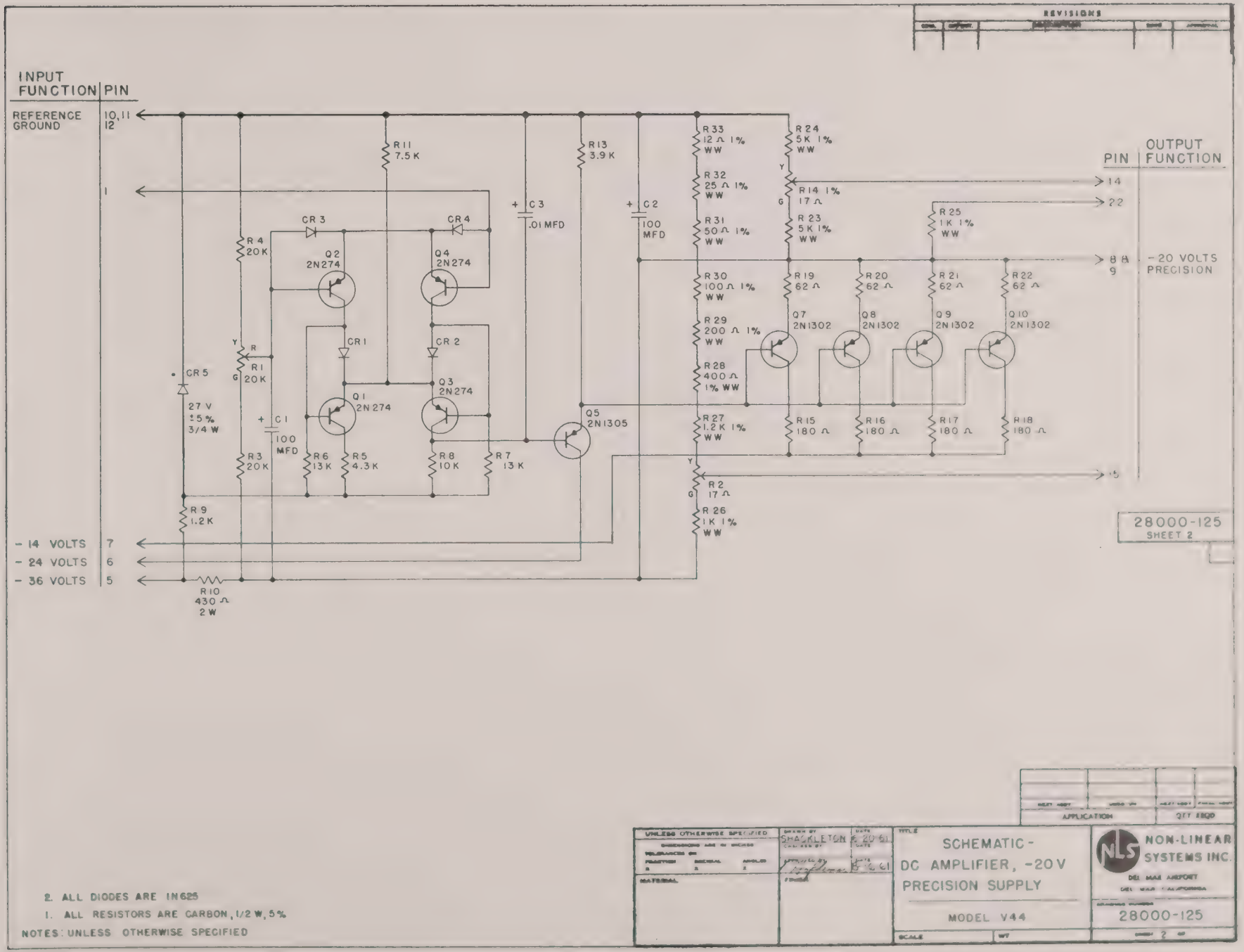
UNLESS OTHERWISE SPECIFIED	DRAWN BY CHARLETON 6 20 6	TITLE SCHEMATIC - AC AMPLIFIER, -20 V PRECISION SUPPLY	NON-LINEAR SYSTEMS INC DEL MAR, CALIFORNIA
MATERIAL		MODEL V44	28000-123
		SCALE	SHEET 2 OF

APPLICATION	QTY REQD

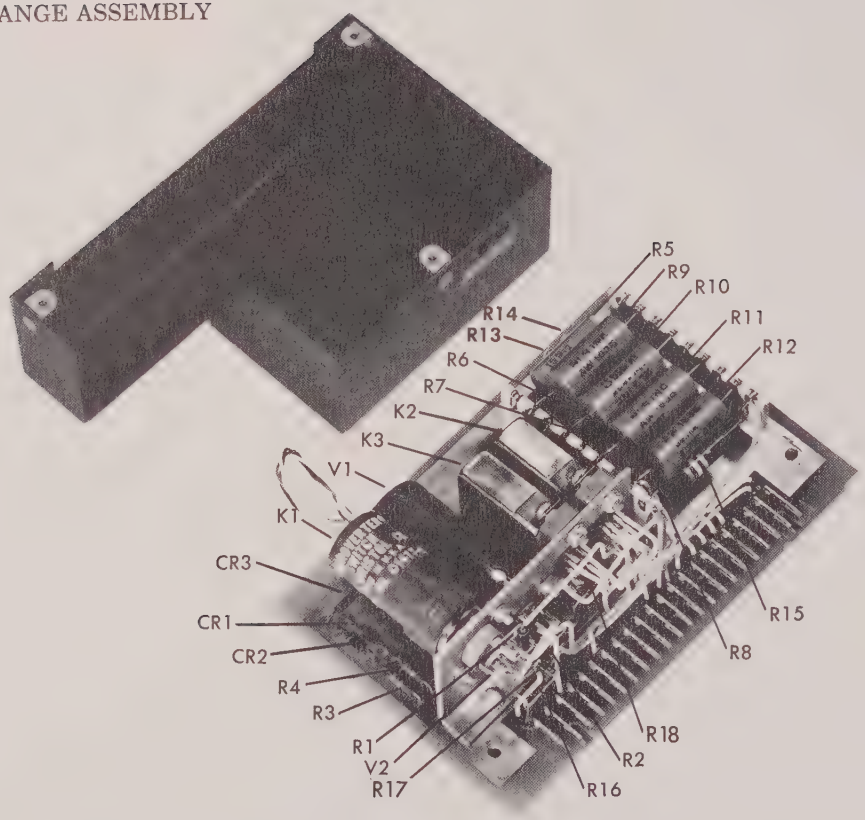
28000-125 DC AMPLIFIER, —20V Precision Supply



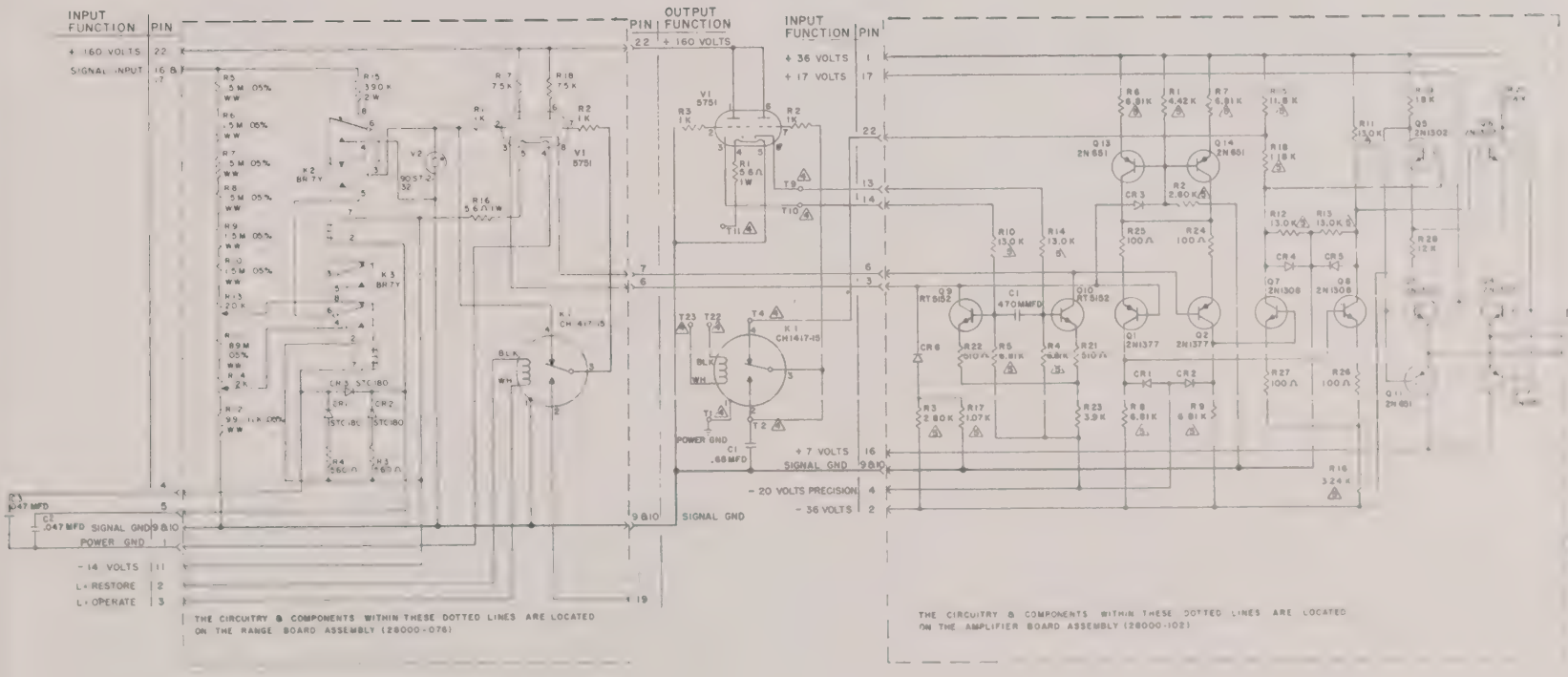
CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
Q7 thru Q10	2N1302	TRANSISTOR, PNP	4	Texas Instruments
Q5	2N1305	TRANSISTOR, PNP	1	Texas Instruments
Q1 thru Q4	2N274	TRANSISTOR, PNP	4	Texas Instruments
R33	PW1719	RESISTOR, 12 Ohms, 1/2W, 1%, WW	1	NLS
R32	PW1719	RESISTOR, 25 Ohms, 1/2W, 1%, WW	1	NLS
R31	PW1719	RESISTOR, 50 Ohms, 1/2W, 1%, WW	1	NLS
R30	PW1719	RESISTOR, 100 Ohms, 1/2W, 1%, WW	1	NLS
R29	PW1719	RESISTOR, 200 Ohms, 1/2W, 1%, WW	1	NLS
R28	PW1719	RESISTOR, 400 Ohms, 1/2W, 1%, WW	1	NLS
R27	PW1719	RESISTOR, 1.2K, 1/2W, 1%, WW	1	NLS
R25, R26	PW1719	RESISTOR, 1K, 1/2W, 1%, WW	2	NLS
R23, R24	PW1719	RESISTOR, 5K, 1/2W, (Matched pair to .004% WW)	2	NLS
R19 thru R22		RESISTOR, 62 Ohms, 1/2W, 5%	4	Allen Bradley
R15 thru R18		RESISTOR, 180 Ohms, 1/2W, 5%	4	Allen Bradley
R13		RESISTOR, 3.9K, 1/2W, 5%	1	Allen Bradley
R12		RESISTOR, 5.1K, 1/2W, 5%	1	Allen Bradley
R11		RESISTOR, 7.5K, 1/2W, 5%	1	Allen Bradley
R10		RESISTOR, 430 Ohms, 2W, 5%	1	Allen Bradley
R9		RESISTOR, 1.2K, 1/2W, 5%	1	Allen Bradley
R8		RESISTOR, 10K, 1/2W, 5%	1	Allen Bradley
R6, R7		RESISTOR, 13K, 1/2W, 5%	2	Allen Bradley
R5		RESISTOR, 4.3K, 12W, 5%	1	Allen Bradley
R3, R4		RESISTOR, 20K, 1/2W, 5%	2	Allen Bradley
R2, R14	0271L-1-17	POTENTIOMETER, 17 Ohm	2	Conelco
R1	0250L-1-20K	POTENTIOMETER, 20K Ohm	1	Conelco
CR5	M2725	ZENER DIODE, 27V ±5%, 3/4W	1	Motorola
CR1 thru CR4	1N625	DIODE	4	Hughes
C3	14M1103	CAPACITOR, .01μf, 100VDC	1	West Cap
C1, C2	PP100B30A2	CAPACITOR, 100μf, 30WVDC (Tantalum)	2	Fansteel


REVISIONS
INPUT FUNCTION | PIN
REFERENCE GROUND | 10, 11, 12
- 14 VOLTS | 7
- 24 VOLTS | 6
- 36 VOLTS | 5
1
R11 7.5K
R13 3.9K
+ C3 .01 MFD
+ C2 100 MFD
CR3
CR4
R4 20K
Q2 2N274
Q4 2N274
CR1
CR2
R1 20K
CR5 27 V ±5% 3/4 W
+ C1 100 MFD
Q1 2N274
Q3 2N274
Q5 2N1305
R3 20K
R6 13K
R5 4.3K
R8 10K
R7 13K
R9 1.2K
R10 430 Ω 2W
R33 12 Ω 1% WW
R32 25 Ω 1% WW
R31 50 Ω 1% WW
R30 100 Ω 1% WW
R29 200 Ω 1% WW
R28 400 Ω 1% WW
R27 1.2K 1% WW
R24 5K 1% WW
R14 1% 17 Ω
R23 5K 1% WW
R25 1K 1% WW
R19 62 Ω
R20 62 Ω
R21 62 Ω
R22 62 Ω
Q7 2N1302
Q8 2N1302
Q9 2N1302
Q10 2N1302
R15 180 Ω
R16 180 Ω
R17 180 Ω
R18 180 Ω
R2 17 Ω
R26 1K 1% WW
PIN | OUTPUT FUNCTION
14
22
8 & 9 | -20 VOLTS PRECISION
5
28000-125 SHEET 2
APPLICATION
QTY REQD
UNLESS OTHERWISE SPECIFIED
DRAWN BY SHACKLETON 6-20-61
MATERIAL
SCHEMATIC - DC AMPLIFIER, -20 V PRECISION SUPPLY
MODEL V44
NLS NON-LINEAR SYSTEMS INC.
DEL MAR AIRPORT
28000-125
SCALE
WT
2. ALL DIODES ARE IN625
1. ALL RESISTORS ARE CARBON, 1/2 W, 5%
NOTES: UNLESS OTHERWISE SPECIFIED

28000-076 RANGE ASSEMBLY



CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION	QTY PER UNIT	MANUFACTURER
CR1 thru CR3	STC180	DIODE	3	Hughes
R17 & R18	Com'l	RESISTOR, 7.5K, 1/2W, 5% (Composition)	2	
R16	Com'l	RESISTOR, 5.6, 1W, 5% (Composition)	1	
K1	CH1417-15	CHOPPER	1	Bristol
V1	5751	TUBE - TRIODE	1	Sylvania
K2, K3	BR-7Y-450-A8-19V	RELAY 14V COIL	2	Babcock
R13	0250L-1	POTENTIOMETER, 20K	1	Con Elco
R14	1250L-1	POTENTIOMETER, 2K	1	Con Elco
R15	Com'l	RESISTOR, 390K, 5%, 2W	1	Allen Bradley
R12	NLS AW1719	RESISTOR, 99.111K, .05%, 1/2W (Prec. WW)	1	NLS
R11	NLS AW1719	RESISTOR, 890K, .05%, 1/2W Prec. WW	1	NLS
R5 thru R10	NLS AW1719	RESISTOR, 1.5 meg, .05%, 1/2W Prec. WW	6	NLS
V2	90-ST-2-32	TUBE, NEON	1	
R1, R2	Com'l	RESISTOR, 1K, 1/2W, 5% Composition	2	
R3 & R4	Com'l	RESISTOR, 560 1/2W, 5% Composition	2	


INPUT FUNCTION
PIN
+ 160 VOLTS 22
SIGNAL INPUT 16 & 17
+ 36 VOLTS 1
+ 17 VOLTS 17
OUTPUT FUNCTION
PIN
22 + 160 VOLTS
+ 7 VOLTS 16
SIGNAL GND 9 & 10
- 20 VOLTS PRECISION 4
- 36 VOLTS 2
.047 MFD 5
.047 MFD SIGNAL GND 9 & 10
POWER GND 1
- 14 VOLTS 11
L+ RESTORE 2
L+ OPERATE 3
19
SIGNAL GND
POWER GND
THE CIRCUITRY & COMPONENTS WITHIN THESE DOTTED LINES ARE LOCATED ON THE RANGE BOARD ASSEMBLY (28000-076)
THE CIRCUITRY & COMPONENTS WITHIN THESE DOTTED LINES ARE LOCATED ON THE AMPLIFIER BOARD ASSEMBLY (28000-102)

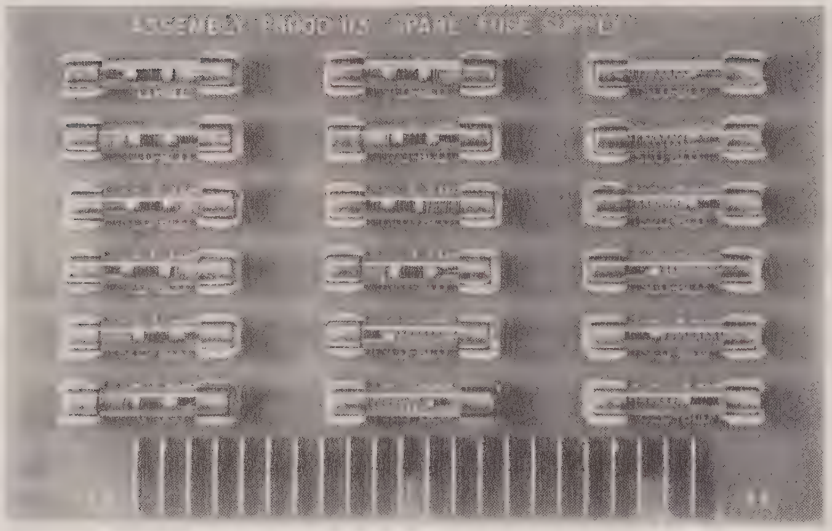
REVISIONS

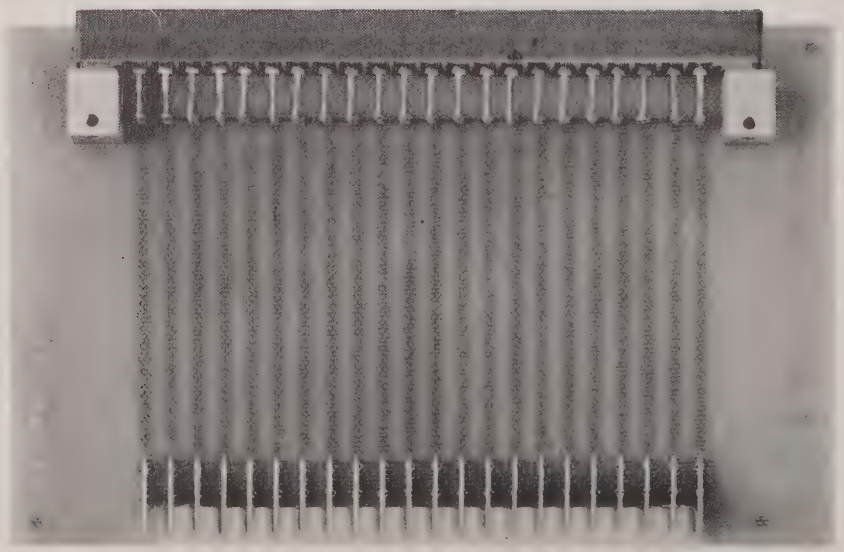
NOTES UNLESS OTHERWISE SPECIFIED

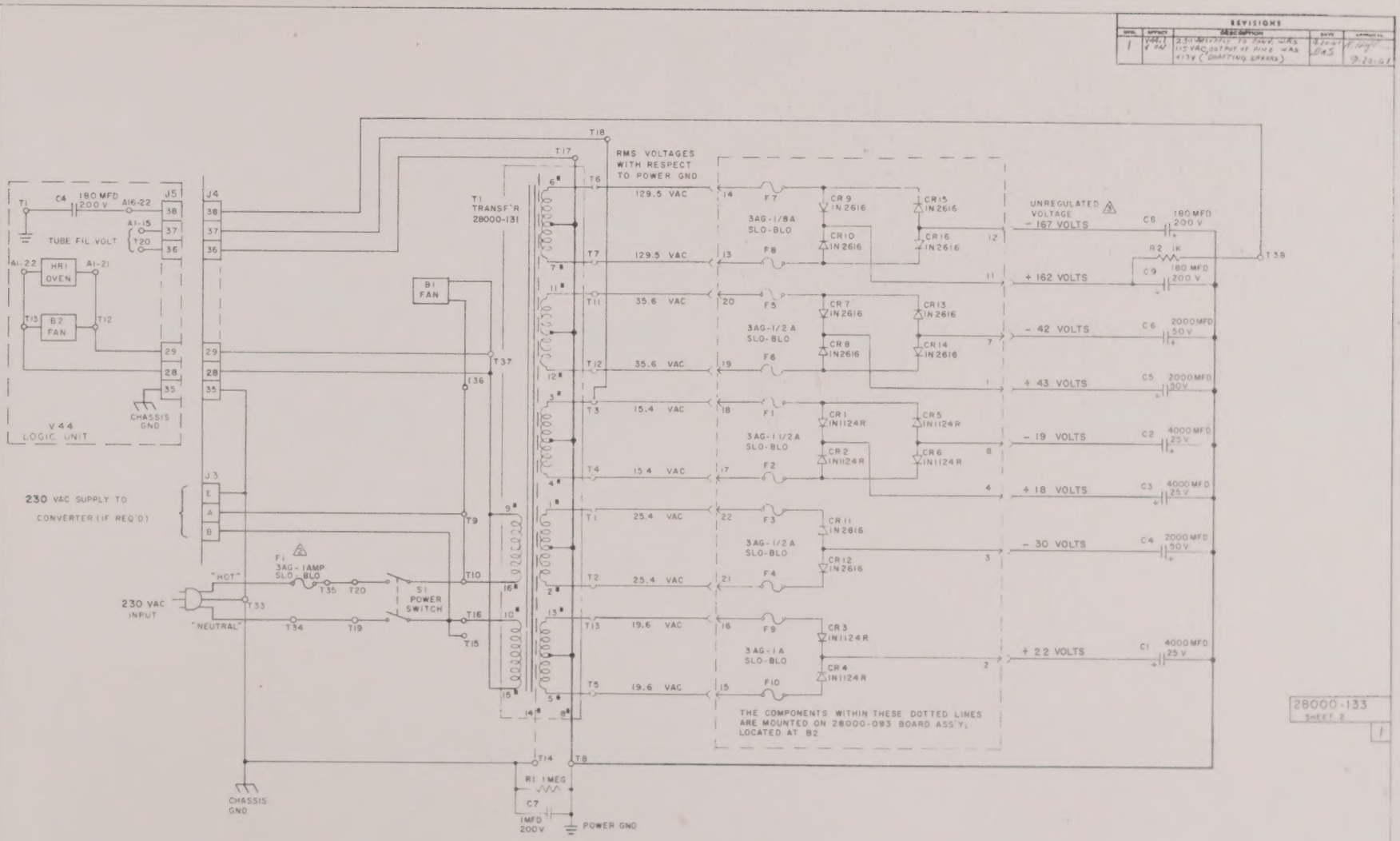
1. ALL RESISTORS ARE CARBON, 1/2 W, 5%
2. ALL DIODES ARE IN 626
3. ALL CIRCUITRY & COMPONENTS NOT SHOWN WITHIN DOTTED LINES ARE LOCATED ON THE LOGIC BASE BOARD ASSEMBLY (28000-118)
4. "T" NUMBERS DENOTE SOLDER TERMINALS ON LOGIC BASE BOARD ASSEMBLY (28000-118)
5. THESE RESISTORS ARE METAL FILM, 1/2 W, 1%, TYPE MEC-72 (IRC)

SCHEMATIC - RANGE & AMPLIFIER

NLS NON-LINEAR SYSTEMS INC





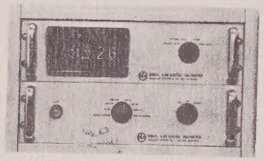


⚠3 THESE ARE NOMINAL VOLTAGES BASED ON 230 VAC, 60 CYCLE INPUT.

⚠4 REPLACE WITH 1.5 AMP FUSE WHEN USED WITH CONVERTER.

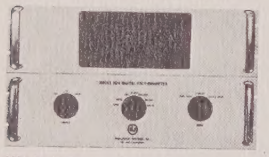
1. NUMBERS DENOTED BY # ARE TRANSFORMER HEADER NUMBERS.

NOTES: UNLESS OTHERWISE SPECIFIED



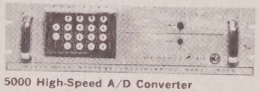
V44 All-Electronic Voltmeter

M25 5-Digit Multi-Purpose Instrument

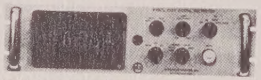


M24 Multi-Purpose Instrument

V24 Voltmeter-Ratiometer



5000 High-Speed A/D Converter

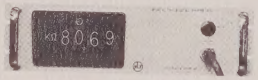


V35B Voltmeter-Ratiometer

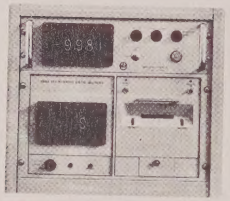
V34B Voltmeter-Ratiometer

481A Digital Voltmeter

484A Digital Voltmeter with Printout



784 Digital Ohmmeter with Printout

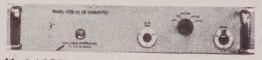


RS2 Data Logger

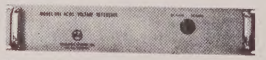
V64A Digital Voltmeter

V60 Digital Millivoltmeter

Model 125E



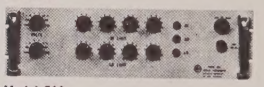
Model 125B



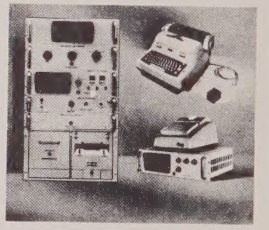
Model 125ER

Model 50

Model 51



Model 54A



DVM Accessories

Most complete line of digital measuring instruments . . . by purpose . . . by price!

PREMIUM DIGITAL VOLTMETERS

V44 All-Electronic Voltmeter Purpose: measuring and data logging for high-speed applications requiring maximum reliability and dependable ±0.01% accuracy . . . 200 readings per sec. of DC voltages from ±0.001 to ±999.9 . . . output for data logging . . . 10 megs input impedance on all ranges without internal or external preamplifiers . . . no decade or amplifier potentiometers to trim; "NO POTS AT ALL" stability is designed in, not trimmed in. . . . remotely programmable. **Price: $6,150**

M25 5-Digit Multi-Purpose Instrument Purpose: applications requiring full 5-digit accuracy with relatively high speed, outstanding reliability, and versatility; missile systems checkout, inertial guidance research, unattended data logging, advanced R & D . . . fastest, most reliable, most versatile 5-digit DVM . . . in 1.1 sec. measures DC voltage from ±0.0001 to ±999.99, DC voltage ratio from ±.00001 to ±99.999, and resistance from 0.1 ohm to 1 megohm . . . accuracy ±0.01% of reading ±1 digit . . . 10 to 1000 megs input impedance . . . with accessories, measures AC voltage, AC voltage ratio or low-level DC . . . fully automatic . . . remotely programmable . . . output for data logging . . . transistorized circuitry, mercury-wetted contact relays. **Price: $6,150**

M24 Multi-Purpose Instrument Purpose: for 4-digit applications requiring M25 features . . . 1/3 sec. balancing time is three times faster than M25 . . . measures DC voltage from ±.0001 to ±999.9 and DC voltage ratio to ±.9999 with ±0.01% accuracy, resistance from 0.1 ohm to 1 megohm with ±0.05% accuracy . . . with accessories, measures AC voltage, AC voltage ratio, or low-level DC . . . transistorized circuitry, mercury-wetted contact relays . . . remotely programmable. **Price: $5,650**

V24 Voltmeter-Ratiometer Purpose: uses requiring M24 features without the need to measure resistance. **Price: $4,950**

R24 Ratiometer Purpose: especially useful in analog computers and potentiometer pickoff data systems . . . measures only DC ratio with ranges of ±.9999/9.999 . . . same features as M24 and V24. **Price: $4,650 (not stocked)**

5000 High-Speed A/D Converter For applications requiring maximum speed with outstanding reliability and accuracy . . . 15,000 readings per second from ±0.001 to ±9.999 volts . . . accuracy ±(0.01% +1 digit) . . . outputs in straight binary or B·C·D code . . . remotely programmable . . . true bipolar operation. **Price: $6,950**

V35B Voltmeter-Ratiometer. This medium-priced transistorized DVM is the fastest full 5-digit stepping switch type instrument . . . "Factual Fifth Figure," resolution of 0.001% . . . measures from ±0.0001 to ±999.99, DC voltage ratio from ±00.001% of ±99.999% . . . accuracy ±0.01% of reading or ±1 digit . . . new double-duty "No-Needless-Nines" logic . . . input filter . . . output for data logging . . . "No-Needless Noise" stepping switches in plug-in oil-bath containers . . . remotely programmable. **Price: $3,950**

V34B Voltmeter-Ratiometer Purpose: 4-digit uses requiring V35B reliability, speed and versatility. **Price: $3,350**

LOW-COST

481A Digital Voltmeter Purpose: this 4-digit instrument is an outstanding value for applications requiring ±0.01% accuracy and completely automatic operation at low-cost . . . does not contain printout connections . . . features plug-in decade resistors and stepping switches for troubleshooting and switch lubrication and replacement in several minutes . . . measures DC from ±0.001 to ±999.9, AC and low-level DC with plug-in accessories . . . basic design proved by six years field use. **Price: $1,425**

484A Digital Voltmeter-Ratiometer with Printout Purpose: this most versatile Industrial instrument is designed for a great variety of low-cost measuring and data logging applications . . . measures DC voltage from ±0.001 to ±999.9 with ±0.01% accuracy and DC voltage ratio from ±00.01% to ±99.99% . . . plug-in stepping switches and built-in print connection and automatic print control . . . AC or low-level DC with accessories. **Price: $1,650**

784 Digital Ohmmeter with Printout Purpose: precise measuring and logging of resistance at low cost . . . features plug-in stepping switches and printer connection and built-in automatic control . . . stepping switches and decade resistors mounted on plug-in boards . . . same basic features at 484A above. **Price: $1,650 (not stock)**

INDUSTRIAL SERIES DVMS

RS2 Data Logger Purpose: highly precise scanning, measuring and recording at low cost . . . scans up to 20 double-pole input channels, measures DC from ±0.001 to ±999.9 with ±0.01% accuracy, and records channel number and 4-digit reading with polarity and decimal point . . . delivered in cabinet ready for use. **Price: $3,600**

V64A Digital Voltmeter Purpose: full 4-digit resolution at lowest cost . . . similar to 481A but has manual range polarity selection . . . accuracy is ±0.01% of full scale . . . measures DC voltage from ±0.001 to ±999.9, AC and low-level DC with accessories. **Price: $1,125**

V60 Digital Millivoltmeter Purpose: making highly-precise low-level measurements without a preamplifier for such applications as calibrating millivolt devices, strain gage and thermocouple measurements, process monitoring, semiconductor research and testing . . . features ±0.01% precision (ability to repeat readings within close limits), unattainable from pointer meters and strip chart recorders . . . accuracy is ±0.1% of reading or ±10 microvolts . . . range is ±00.01 to ±99.99 mv . . . extremely high AC and DC common mode rejection . . . scale factor control to permit display in units of pressure, weight, length, strain, etc. **Price: $1,625**

ASSOCIATED INSTRUMENTS AND ACCESSORIES

AC/DC Converters Purpose: provide advantages of digital measurements for AC voltage and AC voltage ratio . . . combine appropriate converter with any NLS DVM for precise, rapid AC measurements over a wide frequency range with high input impedance . . . accuracy: ±0.1% . . . ranges: 9.999/99.99/999.9 volts AC . . . speed: 3 sec. avg. . . . frequency range: 30 cps to 10 kc.

Model 125E ($1,200) for use with NLS premium DVMs . . . features automatic ranging. Model 125B ($1,200) for use with NLS Industrial DVMs and RS2 . . . manual ranging. Model 125ER ($1,650) AC voltage ratio measurements with M25, M24, V24, V35B, V34B. (125E or 125B also required.)

CS2 Calibration Console Purpose: highly accurate calibration of AC and DC digital voltmeters, ratiometers and ohmmeters . . . extremely fast, simple "push-button" operation. **Price: upon request (not stock)**

Prices and specifications are subject to change without notice. Shipment is within 3 days after receipt of order at Del Mar — 30 days max. if stock becomes depleted. Non-stock models require 90 days max.

Voltage Comparators

Model 50 Voltage Comparator — a transistorized instrument with manual limit setting from ±0.001 to ±999.9 volts . . . signals tolerance by colored bulbs and contacts within 90 ms . . . ±0.02% accuracy . . . 10 megs input impedance. **Price: $1,775**

Model 51 Voltage Comparison Amplifier — applications where limits are already in voltage form . . . wide range, high sensitivity, high input impedance, transistorized. **Price: $ 950**

Models 54, 54A, 55, 55A Digital Comparators — plug into any NLS DVM with printer output connector for go/no-go indication of input limits . . . limits set by BCD voltages, contact closures, or knobs on the comparator . . . signals TOO HIGH, TOO LOW, or OK to recorders or control devices. **Prices: $2,000 to $2,900**

DVM Accessories Purpose: to form any of hundreds of measuring and data logging systems by easy, plug-in combination with NLS DVM's . . . accessories include AC/DC converters, remote readouts, preamplifiers for low-level DC, transistorized input scanners, data printers, serial converters, Flexowriter systems, electric typewriter systems, tape punches, digital comparators.

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